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IN BUILDING A ROAD ACROSS A SWAMP THE EMBANKMENT SETTLED THROUGH THIRTY FEET OF MUCK TO SOLID CLAY BOTTOM, FORCING THE MUCK OUTWARD AND UP ALONG THE FOOT OF THE EMBANKMENT AS SHOWN IN THE ILLUSTRATION. THIS WORK WILL BE DESCRIBED IN THE NEXT ISSUE.

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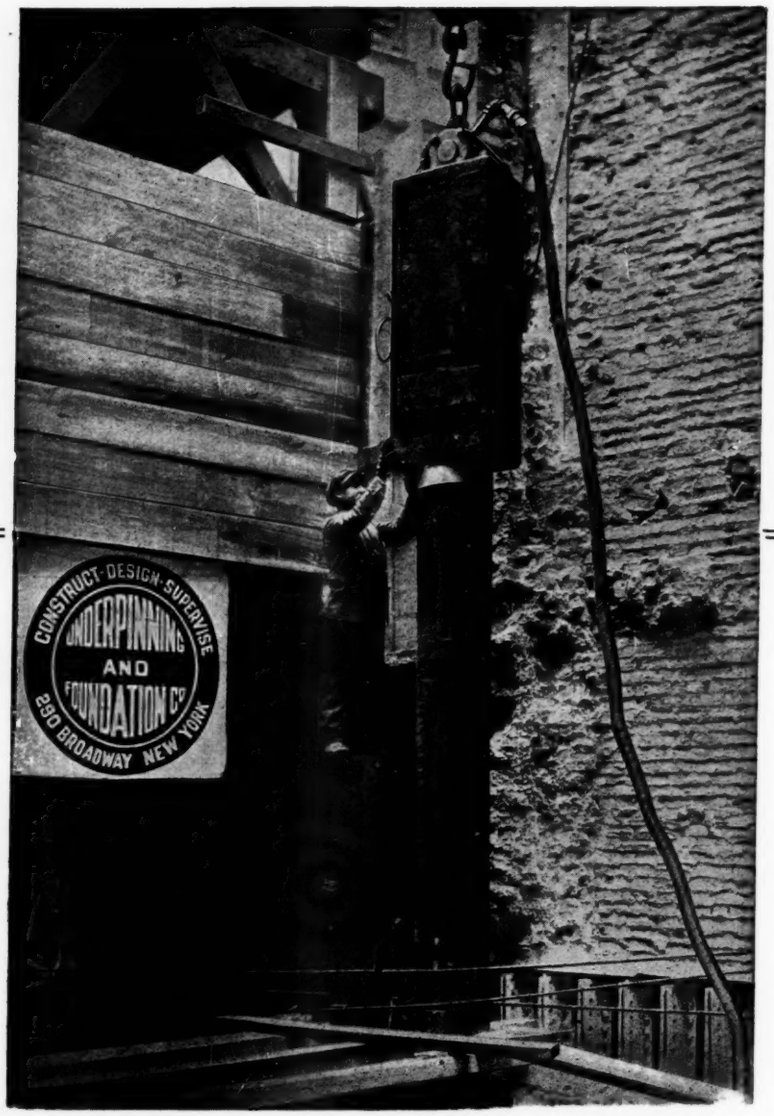
JANUARY 8, 1921



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Manhattan Borough Asphalt Plant

Improvements effected and planned include pumping asphalt from tankers to storage, operating sand drier by electric motor, unloading sand and stone by electric crane, handling stone dust with barrel elevator, elimination of trailers, installation of asphalt reclamation plant, standardization of equipment, and construction of garage extension and machine shop.

The municipal asphalt plant of the Borough of Manhattan, New York, was built several years ago and has been operated solely to provide for maintenance and repairs of the borough pavements, all of which are built under contract and kept in order by the city forces. The plant occupies all of the block between 90th. and 91st. street facing on the East river and has an area of about 200 x 500 feet, with a bulkhead about 270 feet long in water 15 feet deep that provides for unloading two large scows simultaneously. The building, plant and machinery are arranged substantially as shown in the plan published on page 772 of Municipal Journal, November 18, 1915, in a description of the plant and its operation. The general features of arrangement and installation are now substantially as there described except for improvements that have been made and are contemplated, the principal ones of which will be described in this article.

The plant has a nominal capacity for the production of about 4,800 yards of binder and surface courses of asphalt pavement per 8 hour shift and at the present time, under the restrictions of freight, materials, prices, labor and other difficulties, is turning out an average of about 3,500 yards per shift with a force of about 22 of the total force of 60 men at the plant, while an average of 11-men asphalt gangs each lay 150 square yards per day besides some double gangs that lay about 600 yards each. Street work is continued through the fall and winter till the snow attains a depth of 3 inches and is resumed when the snow disappears, thus making an average of about 10 working months per year, which, last winter, on account of the extraordinarily severe weather, was reduced to about 9 months.

PUMPING ASPHALT

Originally the asphalt was received solid in barrels that were broken up, stripped from the asphalt, and the latter elevated to the service tanks and dumped in them by hand, thus involving a considerable amount of labor and loss of time. This system has been superseded by that of direct pumping from tank boats in which the asphalt is heated sufficiently to maintain it liquid. As soon as the boats have been moored at the bulkhead, live steam from the 150 h. p. battery of Babcock and Wilcox boilers that supply power for the plant is turned into the tanker to maintain the heat previously supplied by tug boat connections. Connections are made to the 6-inch pump line 250 feet long and the pump on the tanker delivers the load of about 40,000 gallons of asphalt to the three 35,000-gallon storage tanks elevated about 40 feet on steel towers adjacent to the mixing room.

The asphalt is pumped through a line of screwed steel pipe supported on the tops of brick piers and containing a 1-inch live steam pipe to prevent the liquid asphalt from cooling in transit. The storage tanks are also kept hot by interior steam coils so that the asphalt is never allowed to cool and is always ready to be drawn into the service tanks.

As soon as the storage tanks have been filled, the operator there signals the pump man on the tank boat, the valve at the top of the line is closed, and the lower end of the line is allowed to discharge into 6 or 8 barrels that receive the contents of the pipe line. At convenience these barrels are carried up to the tanks and are there inverted on an overhead rack and left to gradually melt and empty their contents into the tank, thus saving a considerable quantity of asphalt that might otherwise be wasted.

The excessive vibration in the pump line has strained the slender brick piers that support it so that they have occasionly been broken. This defect is to be remedied by capping the piers with horizontal steel plates on which will be placed nests of gas pipe rollers, retained between guides, and supporting movable top plates to which the gas pipe will be bolted thus enabling the latter to move back and forth longitudinally without straining the brick piers.

HANDLING SAND AND STONE

At present the coal, sand, and stone barges are unloaded by a one-yard clam-shell bucket operated by the boom of the steam derrick, which delivers to

dump cars on a wooden trestle 400 feet long, which carries them over the tops of the storage bins, into which they are dumped through openings in the roof. The loaded cars run from the bulkhead to the bins by gravity and are hauled back by an automatic counterweight rope. This arrangement will soon be superseded by an electric unloading and transferring apparatus consisting of a locomotive crane with 50-foot boom operating the clamshell bucket which will deliver to a portable hopper of 10 tons capacity from which it will be drawn off by a self closing valve operated from the bottom. This hopper of 90 cubic feet capacity, will travel back and forth on a car provided with independent locomotive power, from the locomotive crane to the storage bins. The crane will operate on a steel plate girder trestle, like a railroad viaduct, which will have a lower track on which the hopper car will run clear of the crane. Contracts have already been awarded for the installation and part of the concrete piers on pile foundations have been built for it. This improvement will very much expedite unloading materials, and is expected to materially reduce the cost of handling.

HANDLING STONE DUST

The stone dust, of which about 1400 bags (60 tons) per day are required for 4,800 yards of pavement, is received in 100-pound bags shipped on barges and unloaded by the contractor, who delivers them over an industrial track and piles them in a brick storage house of 800 tons capacity, in an overflow wooden shed of 500 tons capacity, besides 200 tons stored on the mixing floor for emergencies. The distance from the bulkhead to the storage does not exceed 200 feet, and if the delivery and piling were not provided for in the contract, an economy might be effected by the installation of a simple conveyer system that would automatically transfer them from the boat to storage. At present the bags are handled from storage to the mixer by an average force of five laborers, which it is expected will be reduced to 2 by the introduction of a barrel elevator that will operate quickly and save moving the bags transversly a considerable distance by hand.

DRIER DRUMS

For the operation of the asphalt plant there is installed a 150-h. p. horizontal Corliss engine that is ample for the purpose but is not provided with sufficient transmission facilities, so one of the 24 x 5-foot sand drums is directly operated by a 20-h. p. electric motor. This motor was originally installed in the dry room where it was impossible to protect it from the great amount of dust and heat in the atmosphere. It has therefor been recently moved to a location in the adjacent engine room and drives the drum through a short transmission shaft and miter gears which enable the motor to be throughly protected from the dust and be kept under the constant observation of the engineer. Great care is taken to provide for the continuous operation of the asphalt plant and, with the exception of the big drum, all parts are kept in duplicate, some of them like gears, that are most subject to injury, are kept in larger numbers so that no delay is ever experienced in providing new parts for repairs or maintenance.

A GARAGE AND REPAIR SHOP

Three years ago a new one-story 48x112-foot brick garage was erected on the 91st street and Avenue A corner of the plant and the original garage was converted into a machine shop. Plans have been drawn and contracts are about to be let to extend the new garage to 90th street by an addition of an 88x48-foot two-story building. When this extension is completed, the machine shop will occupy the second story of the new building. This arrangement will afford better working conditions for the machinists in the way of light and air, less interruptions, etc. This floor will also have a dustproof compartment for the painter where all enamelling of touring cars will be done. Entrance to this second floor will be gained by a ramp, extending into the yard at about a twelve per cent grade, which saves the space in the garage and machine shop that would be taken up by an elevator. The cost of an elevator is considerable and there is also an upkeep and operation expense and a possible chance of it being out of order at a critical time. The ramp overcomes all the above conditions.

At present compressed air for pneumatic tires is furnished by a small electric pump mounted on a little truck that is wheeled from place to place to serve the different antomobiles, about 20 of which leave at about the same time. This is being replaced by a stationary automatic electric pump mounted on the wall and delivering to a receiving tank connected to distributing lines running around the garage and having ten outlets commanding all parts of the place and enabling many different tires to be inflated simultaneously. As this system requires a pressure of 80 pounds or more, it may prove advisable to extend the pressure line to the machine shop and provide outlets there for the operation of small pneumatic hand tools.

The machine shop is equipped with drills, planer, shaper, lathes, and other tools operated by individual electric motors and is supplemented by an excellent smith shop with several forges, power hammer, grinding wheels, and other appliances sufficient for all repair work and for simple construction. In these shops considerable work is now in progress, including the reconstruction of ten 5-ton army trucks of those alloted by the Federal Government to the State Highway Commission at Albany and by them turned over to New York City. Some of the more delicate parts of these trucks have to be renewed, dump bodies have to be substituted for the original platform bodies, and in some cases, changes made in the frames; all of which it is estimated can be accomplished for about $700 each, as compared with $5000 which would be the cost of a new truck of the same capacity. The platform beams have been cut off at the rear end by an oxy-acetylene flame to provide for the dumping arrangement, and the old wooden boxes have been reinforced with angle irons on the bottoms, insulated with ¾-inch asbestos board covered with steel plates at an expense of about $200, as compared with $600 for the standard steel boxes manufactured by the truck makers for conveying hot asphalt.

The reinforced boxes will not of course be as durable as the builders' boxes, but will probably last two or three years and, when equipped with

the power dumping hoists that have been provided, will prove efficient and convenient.

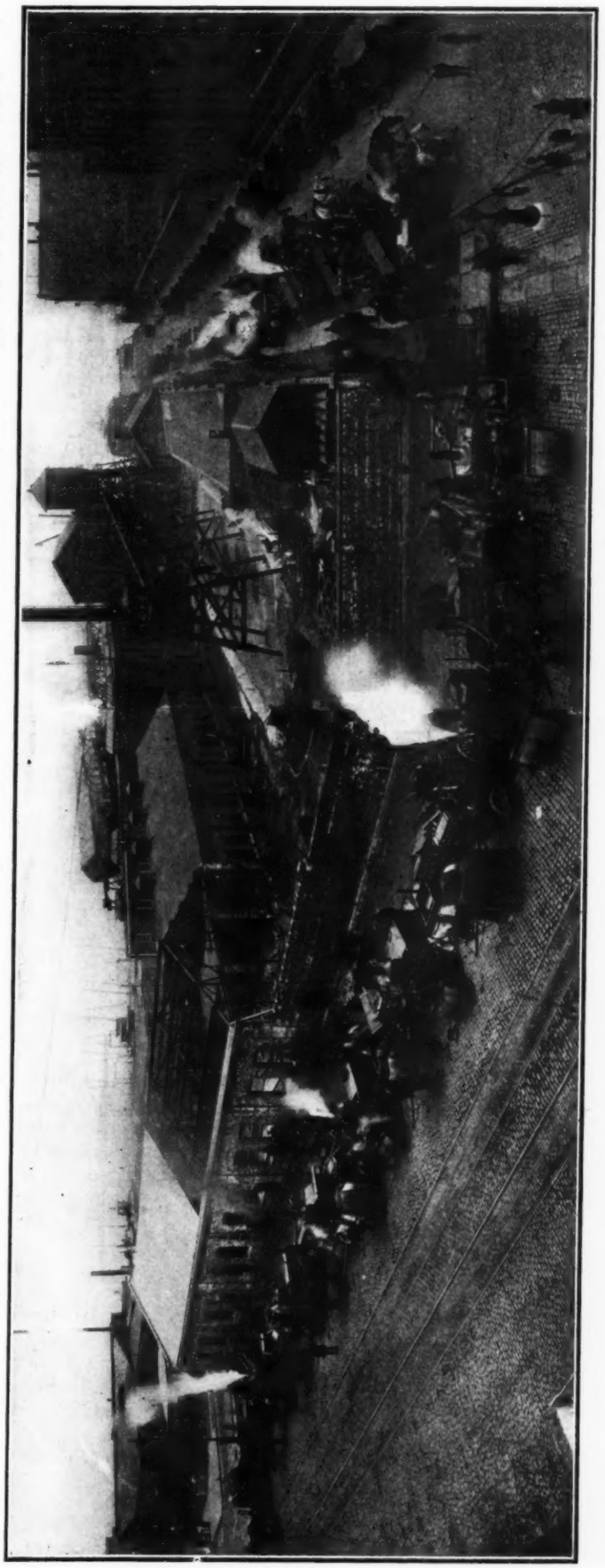
Among the miscellaneous improvements that have been completed recently is the construction of an oil separator in the garage floor to prevent the discharge of waste oil from the floor into the sewer. Among those contemplated in the near future are the enlargement of the binder stone storage bin by extending its concrete walls; the construction of an enlarged stone dust storage building; the construction of a reclamation plant to save a large per cent of the asphalt in condemned pavement that is now abandoned, and to procure from the broken concrete a substitute for stone dust. It is estimated that this plant will cost about $22,000 and will effect a saving of $12,000 per year.

Plans are under way to take care of the dust created in the plant by the installation of a dust collecting system operated by a 25 h.p. motor. When this work has been completed the plant will be 100 per cent dustless and the dust which now goes to waste will be returned to the sand elevators and used in the manufacture of the asphalt. This induction system will also assist the forced draught now used under the fires of the dryers and will increase the output of the plant.

Efforts are being made to provide some system of standardization for the equipment, especially for trucks, of which there are several sizes and types, necessitating a large amount of spare parts kept in stock which would be greatly reduced if fewer makes and sizes were maintained. The purchase of a certain type of truck has been discontinued and eight of those on hand have been scrapped. Instead of selling them for little or nothing, they have been disassembled and all of the good parts carefully inspected, sorted out, and stored to use for spare parts for the remaining 10 trucks of the same type. A store room has been established in which all spare parts, supplies, accessories and tools are kept in charge of a storekeeper, who issues them only on signed requisitions, maintains an accurate inventory and records, and will permit no workman to help himself to supplies, thus materially reducing the temptation to demand certain articles because they are attractive when they are not really needed.

PRINCIPAL EQUIPMENT

The equipment maintained at the plant now includes 26 trucks and trailers for the transportation of hot asphalt binder and finishing course. These comprise 8 five-ton Hurlburts, 1 five-ton Packard, 1 three and one-half-ton Stewart, 7 five-ton Saurers, 1 two and one-half-ton Dodges, 7 two and one-half-ton Republic; also 1 one and one-half-ton Autocar, manned by a chauffeur and two men used for emergency, such as cave-ins and dangerous breaks in pavement, thereby eliminating the movement of an entire gang in such cases.



NOTE: The illustration shows the Manhattan asphalt plant and storage yard. The garage is shown with the roof not yet completed. In the background is the mixing house with the elevated liquid asphalt tank adjacent. The horse-drawn trucks shown have been replaced with motor trucks.

There are sixteen Iroquois, Good Roads, and Kelly-Springfield steam rollers of 5, 8, and 12-ton sizes, and thirty-four 5-ton Watson and Woonsocket 2½-ton trailers. There are five Lutz asphalt heaters, each of the capacity for about 1600 square yards daily. These heaters are usually sent out on the work in the spring, remain outside during the entire season and return to the yards only for repairs or for the winter storage.

Besides serving the asphalt requirements, a part of the yard is used by the Department of Sewers, and affords storage for some of its automobiles and trucks, for concrete materials, and for brick and various sizes of tile pipes, castings, and other supplies.

The plant is under the supervision of chief engineer C. M. Pinckney and principal assistant engineer E. F. Raleigh. It is the direct charge of superintendent Charles J. G. Doherty, who is executing the improvements described, and has planned many of them. Jas. B. Reilly is foreman in direct charge of operation of plant and transportation.

Notes on English Sewage Treatment

During July to September, 1919, Thorndike Saville visited England and France on a Sheldon Traveling Fellowship in Engineering provided by Harvard University. Special attention was given by him to sewerage and river control and regulation. The following notes represent the more interesting of the data concerning sewage treatment in England as contained in his report covering these investigations.

The disposal of the sewage of the northern part of Liverpool by broad irrigation was said by Alexander Brodie, city engineer, to be economically satisfactory but decidedly objectionable from a sanitary standpoint, the effluent being highly putrescible and polluting badly the small stream into which it discharged. There is now on foot a scheme to abandon the farm, cut a tunnel 200 feet along through a hill and connect with the Liverpool main sewers which discharge into the Mersey river. This river is one-half mile wide at the point of discharge, with a tidal ebb and flow at a rate of three or four knots. The original sewage farm cost $750,000. The new project will cost about $500,000 and was the one originally advocated, but the Local Government Board decided in favor of sewage farms.

GREASE EXTRACTION

Bradford.—The sewage of Bradford contains a very large amount of wool grease and dye stuffs, and the chemical composition varies greatly from day to day. The wool grease prevented successful sedimentation, and for a number of years the sewage was treated by precipitating the sludge by the addition of sulphuric acid. Sludge is delivered to the Esholt works, containing 85 per cent of water and 30 to 35 per cent grease. It is screened and run into tanks, where enough sulphuric acid is added to keep it neutral. In these tanks the sludge is boiled with live steam to liquify the grease and aid in its separation. From the heating tanks the sludge passes to closed vessels, from which it is forced by compressed air to the filter presses.

The presses are of the usual type, with cotton filter cloths. There are 128 presses filling a room 150 feet by 300 feet. The cake from the presses contains 20 to 25 per cent of water and 15 to 20 per cent of grease. No attempt is made at present to extract the grease, the cakes being drained and sold for fertilizer, as it contains some 2 per cent of nitrogen. The liquid from the presses is conveyed to a cast iron separating vat, from which the grease, as it accumulates, is run off and pumped to the grease purifying vats. These are 16 in number, of steel, lined with lead. Here the grease is boiled with sulphuric acid and at times with other chemicals. After boiling, the vats stand for 24 hours, after which the grease is withdrawn and packed in barrels or tank cars. A solvent process is to be installed similar to that at Huddersfield, described below, which will extract the grease remaining in the cake.

The effluent from the precipation tanks is conveyed to sand filters or for surface irrigation. There are some 400 acres available for this purpose. The entire plant is designed to treat 30 million gallons per day, with additional provision for the settlement of 12 million gallons of excess storm water.

At Frizinghall, where precipitation of the sludge occurs, there was originally a set of sulphur burners at a gas plant. These burned the spent oxide from the gas works, which contained 50 per cent of sulphur. This SO_2 gas was first admitted to the sewage through a grid of perforated pipes at the bottom of the tank. Later it was mixed by admitting it directly by means of baffle walls, the flow of SO_2 being directed in opposition to the flow of sewage. The gas remaining was passed into a tower down which the sewage trickled. It was thought that by this double process a very thorough admixture and dissolving of the gas would be obtained. The entire process was abandoned, however, because it was found that the sewage would not absorb enough SO_2 to get a proper precipitate. The use of H_2SO_4 was found less costly, owing to the ability to get a more intimate mixture and consequently less volume of acid was needed. Bradford sewage has an alkalinity of 40, but the failure of the SO_2 process

here is of interest, owing to its similarity to the Miles-acid process. This plant made some $500,000 during 1918.

Huddersfield.—The Huddersfield sewage works were distinctly the cleanest appearing and the most odorless of any of the plants visited by Mr. Saville. The sewage goes through coarse screens, then to detritus tanks, which are cleaned by a large bucket on a traveling crane. From these the sewage passes to sedimentation basins. The effluent goes to rotary sprinkling filters and the sludge is pumped to elevated tanks.

In these tanks the sludge is treated with 80 per cent sulphuric acid and is agitated by air blown through it. The wet sludge as it leaves the tanks contains 90 per cent water and 3 per cent grease. This gives a grease content of 30 per cent of the perfectly dry solid matter of the sludge. Cold pressing reduces the water content to 50 per cent after 12 to 24 hours in the presses, the grease content then being 15 per cent. From the presses the sludge cake is carried on a conveyor to granulators and thence to a Ruggles rotary dryer, where it is dried to 15 per cent moisture, giving a grease content of 25.5 per cent. After this, the sludge is elevated to the extraction tanks, where benzine is applied in the solvent process, which reduces the grease to 5 per cent of the dry solid matter, the material then containing about 12 per cent moisture. The resulting cake is sold for fertilizer as it contains 3.5 per cent nitrogen. The grease recovered in 1919 sold for $175 a ton.

Morley.—The plant at Morley, like those at Bradford and Huddersfield, treats the wool waste sewage by the sulphuric acid solvent process. It is a recently constructed plant and contains the best features of the two other plants. Originally the sewage was treated with lime, settled, and the effluent passed into filters while the sludge went to drying lagoons. This has been abandoned and 80 per cent H_2SO_4 is now used as a precipitant. Acid was found to be the cheaper, in addition to rendering the grease content available. Moreover, the quantity of sludge was reduced to 25 per cent, while the total amount of grease in the smaller volume of sludge was greater. The precipitated sludge is fed into sludge boiling tanks, heated by blowing live steam into them for four hours, the steam acting also as an agitator. A narrow-gage track runs beneath the presses and the pressed sludge cake falls into small cars and is rolled to a dump. The grease and water are conducted to a settling tank, where the grease is trapped and runs into settling tanks. From there it goes to a grease ram and thence to refining tanks, where the grease is refined by raising it to the boiling point by a steam coil and spraying with cold water, adding 2 or 3 per cent of sulphuric acid if necessary and mixing for four hours. Five and a half tons of grease per week were extracted and sold at a profit of $700 per week.

The pressed cake for a time was used, after air drying, as fuel for the boilers, mixed with coal. Later a benzine solvent process was installed and run at a profit of $940 a week. The original sludge contained 30 to 48 per cent of grease when dried. The final cake from the solvent process contains 4 per cent grease and is used as a fertilizer.

It should be pointed out that the plants at Bradford, Huddersfield and Morley treat a sewage containing a high proportion to wool waste and that the grease content rarely falls below 30 per cent of the dried sludge. The operators are unanimous in concluding that such plants can be operated at a profit only when the dried sludge contains at least 15 per cent grease, and even then only under prevailing prices of grease. The Morley plant has been the most profitable and satisfactory of all similar disposal plants in England. Mr. Saville quotes Alexander Brodie as expressing the opinion that these plants will do well to clear operating expenses with the decline from war prices for grease, and as being very sceptical of the Mills-acid process when applied to a city installation.

ACTIVATED SLUDGE

Mr. Saville visited Dr. Arden of the Rivers Committee at Manchester, whom he found to be very well informed concerning American experiences in activated sludge and who has operated two experimental plants using this method, one at Witthington, where the sewage is weak domestic, and the other at Davyhulme, where there is a strong sewage containing trade wastes.

The operation of the latter was seriously interfered with by the trade wastes incidental to the manufacture of explosives and it was necessary to curtail the discharge of certain wastes to the sewers and to increase the aeration period of the tanks. In general, however, both experimental plants worked well.

An especially novel feature of the Davyhulme plant is a mechanical arrangement of valves such as to provide intermittent admission of air for aeration. The usual arrangement is for application of air for five seconds, with rest of ten seconds. A working pressure of four to five pounds is used and the air consumption at best, in the previous experimental works, was about 1.28 cubic feet per gallon of sewage treated. A new plant just constructed was expected to take 1.5 cubic feet of air per gallon at 3¼ pounds per square inch.

Dr. Arden was very optimistic regarding the use of the effluent and sludge for agricultural purposes. Certain experiments at Wolverhampton, where a somewhat similar plant is in operation, seem to justify this conclusion. Neither centrifugal nor steam presses have served to effectively dry the sludge. It is suggested that some sort of electric centrifuge may eventually be devised making use of a charged electrode to rupture the charged colloidal particles of centrifuged sludge.

Bradford.—Some experiments had been made with activated sludge at Bradford, but it was found that with this sewage the process was too susceptible to temperature changes. If a cold snap occurred the precipitated sludge became deflocculated. Also, the problem of de-watering the sludge was a determining influence, as this would

have entailed prohibitive expense when treating 400 to 500 tons of sludge per day.

Sheffield.—At Sheffield were being conducted the most novel and startling experiments on activated sludge that Mr. Saville had heard of. The plant at first consisted of two tanks each holding about 1,200 gallons, equipped with revolving paddles set horizontally. These were originally designed to suck air in through a tube by creating a vacuum. It was found, however, that no air was required. Sufficient sewage is admitted and the paddle rotated for eight hours, when the sewage is allowed to settle for one hour, and an absolutely clear, odorless and stable effluent is drawn off. If samples of fresh and activated sewage are placed in bottles, the former remains black with suspended matter for days, while the latter clears in half an hour, leaving an odorless and colorless liquor that remains stable for over a week. There was a large experimental plant operating in which the paddles were vertical, two sets rotating together. In this way about 10,000 gallons per day were treated. The fresh sewage was passed through grit chambers, where it remained for half an hour or so and then flowed directly to the activation chambers. The sludge was drawn off not more than once a month. Nothing had yet been done toward de-watering the sludge. This process seems to possess all the good results of the ordinary method with no air pipes or diffusers to bother with.

OTHER METHODS

At Manchester the old works consist of coarse screens, sedimentation basins and 110 acres of contact beds. The latter were badly overgrown from neglect due to the shortage of labor during the war, and were being cleaned.

At Carlisle some 300,000 gallons per day were treated on four acres of sprinkling filters, about 1.5 acres being used at a time. The spraying device consisted of ½-inch perforations in the 3-inch distribution pipes, there being circular splash plates one inch in diameter for each hole. The settled sludge was flushed onto beds, dried and sold to farms. The entering sewage was screened and then pumped to sedimentation tanks, from which the effluent went to the sprinkling filter.

At Birmingham an interesting scheme was being tried using two-compartment septic tanks, the tanks being separated from each other and on the same level instead of the vertical arrangement of the Imhoff tank. The sewage flows first through the detritus tank equipped with a hydraulically operated dredge. Then it flows through fine sedimentation tanks in parallel, then through a balancing tank, and then to the stream. The sludge is pumped from the sedimentation tanks about once a week to digestion tanks, which are really lagoons. The sludge contains 92½ per cent water. The dried sludge is quite odorless.

A Concrete Job Mechanical*

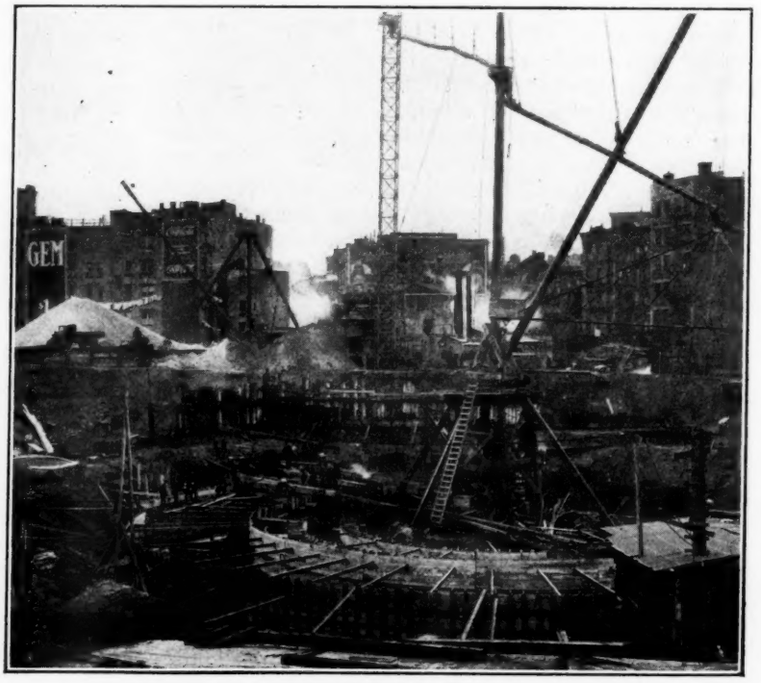
Handling the concrete aggregates. Forms for foundation walls. Reinforcement steel.

HANDLING MATERIALS

For the sub-structure contract there are required about 17,000 yards of 1-inch broken stone from the Calvin Tompkins quarries at Tompkins Cove, on the Hudson river, 9,000 yards of sand from Cow Bay, Long Island, and 114,000 bags of Portland cement of the Pennsylvania Cement Co.'s brand. All of which are delivered by the contractor's fleet of about 50 Pierce-Arrow motor trucks.

The cement is hauled about half a mile from the dock to the cement storage shed, which has a capacity of 30,000 bags. From here it is loaded by hand into a 1-yard steel bucket hoisted in a steel tower about 40 feet high to the charging platform of the concrete mixer, where the bags are opened and emptied by hand into the charging hopper and the empty bags dropped through a chute in the floor to the bag house, where they are cleaned by a hand-operated Century cement bag shaker that recovers 2 or 3 bags of cement from every

*Concluded from page 8.

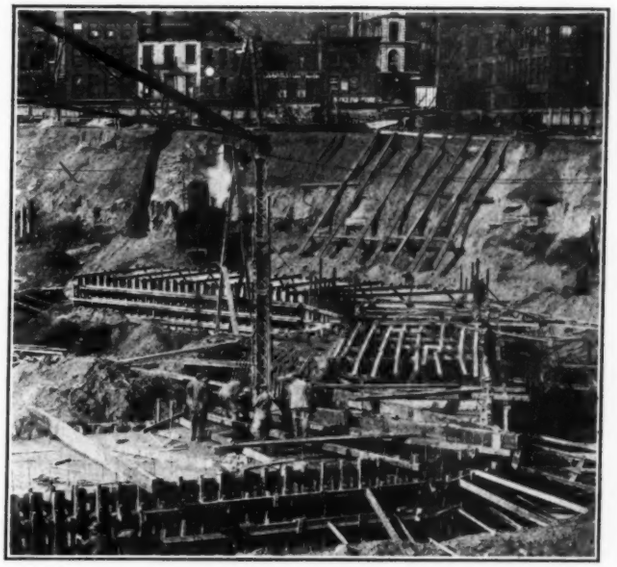


PAIRS OF CURVED REINFORCEMENT BARS USED AS RANGERS ON CONCRETE FORMS

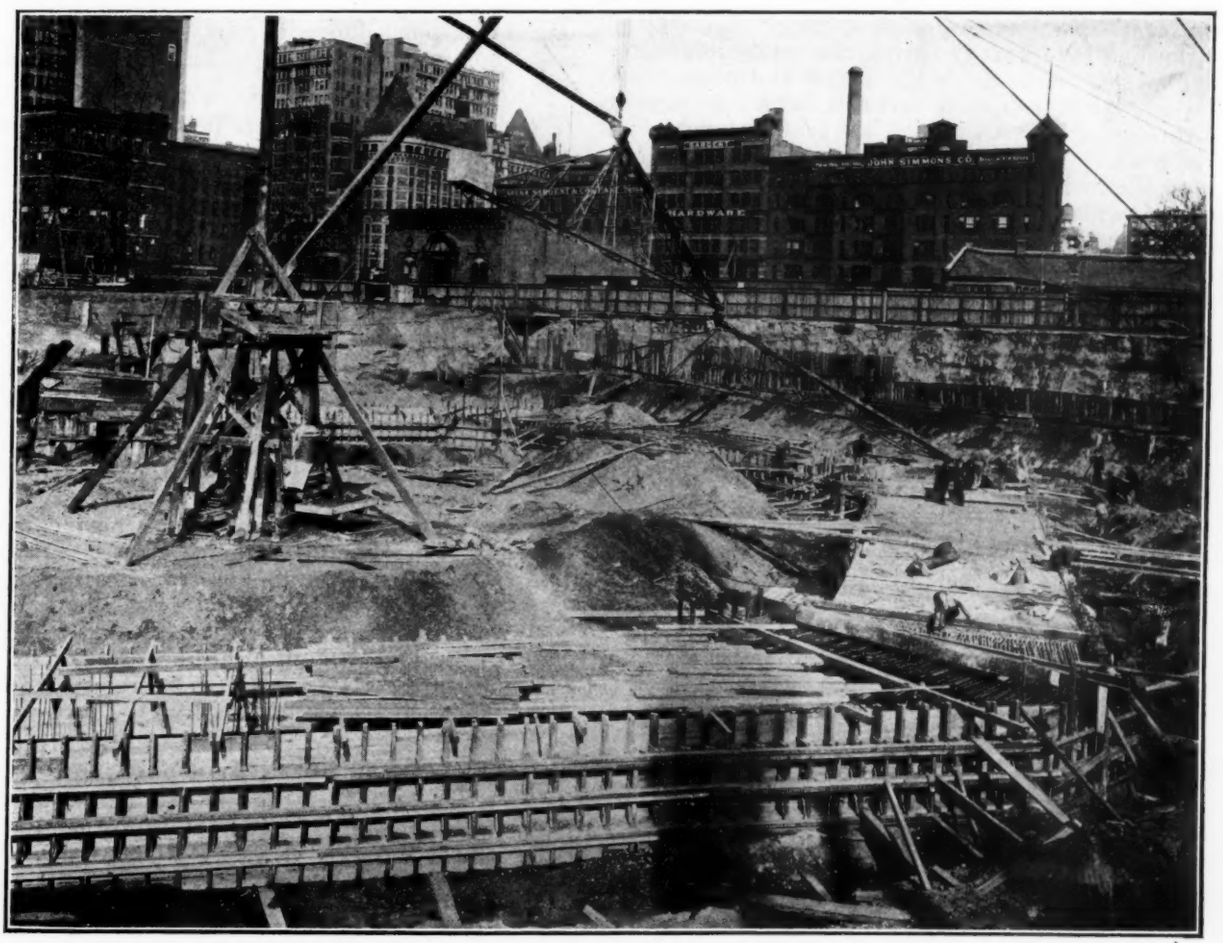
100 empty bags. The empty bags are placed in a Rowe baling machine, which folds and compresses them and holds them while they are securely wired in lots of 50. This arrangement insures a considerable economy in saving cement and bags and in preparing the bags for transportation so that none can be lost, damaged or withdrawn from the package in transit.

Sand and broken stone are delivered at the pier at the foot of Jefferson street, East river, on barges of 500 to 600 yards capacity, which are unloaded by a 1-yard clam-shell bucket operated by a derrick and hoisting engine which deliver to an elevated hopper bin of 15 yards capacity which is used alternately for stone and sand. The bottom of the bin is about 8 feet above the deck of the pier, with clearance under it for the motor trucks that are spotted there while the operator opens both of the two gates and fills the trucks in about 1 minute. Each truck averages from 20 to 22 round trips in one 8-hour shift.

At the court house the trucks are backed up a plank paved inclined fill against a timber sill over which they dump at the edge of the storage pile, the lower portion of which is partly confined by wooden bulkhead walls. A 1½-yard clam-shell bucket operated by a 60-foot derrick boom reclaims the stone and sand dumped from the trucks and constantly keeps filled the small bins in the concrete tower. When not employed in this service it reclaims the sand and stone dumped at the foot of the storage and trims them up in tall piles, always forming a large reserve stock for use if the delivery of the barges is interrupted. The



FORM FOR OCTAGONAL FOUNDATION RING. INCLINED SKIDS FOR SLIDING REINFORCEMENT BARS FROM STREET TO EXCAVATION



POURING CONCRETE IN OUTER RING FORMS FROM DUPLEX REVOLVING SPOUTS.

stone and sand are drawn through bottom gates in the elevated bins to the charging hopper, so that the mixer can be operated at maximum speed. Large steam coils are installed on the ground under the bottoms of the storage piles so that in cold weather the entire piles can be heated and keep the aggregate at a suitable temperature for mixing whenever the temperature is high enough to permit the concrete work to be carried on. Provisions are also made for heating the concrete mixing water with live steam if necessary.

CONCRETE FORMS

The foundation walls are built successively and each ring is built in successive sections in wooden forms made up of panels about 20 feet long and 7 feet high, built on carpenters' benches adjacent to the work and put in position by hand. They are of very simple construction, made of 1-inch tongue-and-grooved boards. The larger pieces are built first and are stripped after the concrete is from 24 to 36 hours old, thoroughly scraped, and reassembled for the next section, and so on, thus using them from 3 to 5 times each. A force of carpenters are continually occupied in building, setting, stripping and cleaning the forms.

The form panels are set against vertical outside posts usually made of 3 x 6-inch timber, spaced about 4 feet apart. These timbers are connected by plain horizontal ½-inch round rods 2 feet apart vertically that pass transversely through the forms and are permanently left there. They are made of ample length and project beyond the faces of the verticals, where they pass through "Universal clamps" provided with set screws. These clamps are adjusted to the right position which determines the width of the forms, after which operation the set screws are screwed up tightly, holding the panels in position against internal pressure and obviating the necessity of cutting threads on the ends of the rods. The rods are heavy enough to resist considerable pressure from the wet concrete and stiff enough not to unduly sag in the long span between the sides of the form, and also serve to support and hold in position any of the reinforcement bars which are wired to them.

When the forms are to be stripped it is only necessary to loosen the set screws, remove the clamps, and take off the verticals and panels, leaving the ½-inch rods projecting several inches beyond the face of the concrete. These projections are then cut off flush with the surface of the concrete, leaving no holes to be pointed and no steel outside the concrete.

REINFORCEMENT STEEL

Notwithstanding their massive character, their abundant bearing surface, and the excellent quality of the sand on which they are seated, the foundation walls are reinforced with a very large amount of reinforcement bars up to 1-inch square, and usually in 38-foot lengths as received from the mill. Near the bottom of the wall there are four tiers of rods about 4 to 6 inches apart, two tiers being transverse under column bearings and two tiers longitudinal. The bottom tier rods are supported on concrete blocks manufactured at the site and are wired together at intersections, forming a complete, independent framework, put in position before the concreting is commenced. In the upper part of the wall there are two tiers of horizontal rods corresponding to those in the bottom, and suspended by wire rope loops from transverse caps reaching across the forms from side to side.

The reinforcement bars are delivered by motor trucks and skidded to the bottom of the excavation on four lines of inclined timbers on the slope of the pit, and at the bottom are assorted, stored, cut to length and bent as required. The longitudinal rods in the curved rings are all bent to the required radius in a motor driven 3-roll bender at the rate of 80 bars per hour, by a gang of 6 men supplying and taking away the bars from the machine.

SPOUTING CONCRETE FROM CHUTES ON COUNTERWEIGHTED REVOLVING TRUSSES

These curved bars have been utilized for outside waling pieces on the forms, pairs of bars being set at top, bottom and intermediate points of the verticals, and wired in position, thus saving a considerable amount of timber and the work of cutting it to the proper curvature, as well as presenting a neater appearance, being more convenient, and without at all injuring the steel for its final use as reinforcement in the concrete.

The spacers used to separate the bottom tiers of reinforcement rods and keep them above the bottom of the forms have a uniform thickness of 3 inches and are made of 1:2 cement mortar cast in slabs about 6 feet wide and 10 feet long on wooden platforms with removable side pieces

3 inches high on each of the four sides. These pieces are clamped in position and the space between them is filled with mortar, screeded off to the level of the tops of the side strips. As soon as the mortar is sufficiently set a straightedge is laid across, connecting corresponding marks on opposite sides, and serves as a guide for a thin-bladed scoring tool which cuts through the full thickness of the slabs, dividing the concrete into strips 3 inches wide and about 18 inches long. After these have set from 12 to 24 hours, the side pieces are removed and the small pieces are detached if necessary by again cutting through the joints with the scoring tool. They are then ready for placing in the forms, where they make an integral part of the monolithic mass, thus providing for the accurate positioning of the steel without introducing any foreign or objectionable element into the concrete. The blocks are made by 3 men who can readily turn out 2,000 in one 8-hour shift.

Guy Lowell, the architect, is represented by a well-organized staff, including Major John H. House, Jr., in general charge; Wm. B. Claflin, superintendent of construction; E. W. Jacobus, clerk of the works, and Harry W. Andrews, designing engineer of structural steel. Moran, Maurice & Proctor are consulting engineers for the foundations.

On December 1, Rodgers & Hagerty, Inc., had completed about 70 per cent of the contract and work is being vigorously prosecuted by an average force of 200 men under the direction of field superintendent Henry Stone and managing field engineer, Walter Caccia. James J. Kelly, of this organization, is in charge of the surveying parties required for the work.

Duluth's Water Scare

A report made public in Duluth by the Academy of Clinical Medicine of that city some days ago notified the city that the drinking water was shown to be unsafe by tests made by Dr. J. A. Cancik, bacteriologist of the academy and who was formerly connected with the water inspection department of the University of Prague. In view of the importance of the subject, the St. Louis County Medical Association called a special meeting at which this report and the analyses of Dr. Cancik were severely criticized. This society stated that the Academy of Clinical Medicine had thrown the whole city into a turmoil of fear on the basis of what it acknowledged to be only a preliminary report based upon a single unsupported analysis which did not show the presence of any B coli, but only a considerable number of miscellaneous bacteria.

On the other hand, the division of sanitation of the state board of health reports that Duluth's water supply has been consistently safe, with a bacterial count generally less than 10 (Dr. Cancik claimed to have found more than 1,400). During the year 1920 there have been 33 cases of typhoid, which was the same number as in 1919; and about 75 per cent of these have been shown to be out-of-town cases, while most of the others were caused by drinking well water, or other causes aside from the public water supply. Moreover, there had been only 16 deaths from diarrheal complaints among children this year as against 19 last year, while the last 2 months have shown no deaths at all from this cause.

The medical association adopted a report tended to allay the public apprehension, stating that the public is entirely safe in drinking the present water. In view of the importance of the matter it recommended that co-ordinate analyses be made between recognized state health authorities and Dr. Cancik.

Solving a New Jersey Water Problem

Three companies supplying twenty-nine communities pool their supplies and propose novel plan for financing additional supply.

Three water companies of New Jersey supply water to 29 cities and towns in the counties of Union, Middlesex and Summerset. These companies obtain water from 13 sources and many of the mains are interconnected so that the companies aid each other in making full use of all of these sources, which are now taxed to their capacity; so much so, in fact, that should a long dry or cold spell occur there would probably be a shortage in this part of the state. As the towns are increasing in population at the rate of about 8,000 a year, it seems to be imperative that an addition to the supply should be obtained. The several companies are acting in unison in the matter and have prepared plans for obtaining an additional supply at the junction of the Millstone and Raritan rivers, about three miles southwest of Bound Brook, plans for developing this source having been made by Morris R. Sherrerd and Allen Hazen and approved by the Board of Conservation and Development of the state.

The companies, however, find themselves unable to raise the necessary funds for carrying out the extension owing to present financial conditions. The combined capitalization of all the companies is a little over $4,000,000 and the cost of developing this supply and of making needed extensions of the distributing mains was estimated at $3,000,000 about a year and a half ago. The companies apparently are anxious to do what they can to bring the supply and the system up to the requirements and are willing to adopt any reasonable plan to this end. They see only three alternatives for obtaining the needed capital: to sell the water works to the towns at a price to be fixed by agreement, by arbitration or by proceedings in condemnation, as the towns may prefer; or second, by sale of

the distribution mains in each of the towns, the companies retaining their trunk mains and the present sources of supply, selling the water to the towns and using the money derived from the sale of the distribution mains for developing the additional supply; or third, by a contract between the towns and the companies which would enable the companies to raise the necessary money.

They suggest as a favorable solution the conveying of the property at the junction of the Millstone and Raritan rivers (where they have purchased about 200 acres of land in the name of one of the companies) to a new corporation which would be organized for the purpose of constructing dams at this point, pumping and sedimentation basins, supply mains, filtration and sterilization plants and reservoirs, the new company to issue 30-year 7 per cent bonds to the amount of $10,000,000, the bonds to be secured by a mortgage on the property of the company and guaranteed by the several existing water companies; the bonds to be issued in the necessary amounts from time to time and offered to the inhabitants of the municipalities which are served by the water companies in question.

"In order to provide security for the principle of said bonds and for payment of the interest that shall accrue thereon, and to enable the said companies to obtain, from time to time, additional capital necessary to maintain and extend their system of water works, rates for water charged by the Elizabethtown, Plainfield-Union and Middlesex water companies and their successors shall be prescribed and fixed for a term of 30 years by a board to consist of three members—one, an engineer to be appointed by the water companies mentioned in this paragraph or their successors; another, an engineer to be appointed by a committee nominated by the governing bodies of the municipalities, or their successors, supplied with water by said companies, or by the governing bodies of such municipalities having a majority, by the last census, of the inhabitants of all of such municipalities; and the third member of the board to be appointed by these two engineers. The decision in writing signed by any two members of such board shall be binding. During the period of 30 years after rates shall be so fixed the same shall be subject to revision at any time, for the purpose aforesaid, exclusively and in the same manner by a similar board or any two members thereof, to be appointed as stated above," if any water company or municipality asks their revision. A contract embodying the above would be entered into between the governing bodies of the municipalities and the water companies, which contract would not restrict the right of any municipality to acquire the property of the water companies by purchase or condemnation.

This plan is described, as well as the conditions which seem to make something of the kind necessary, by a statement issued jointly by the water companies. This statement also asserts that legislation would be necessary for carrying out this plan. It offers to the towns interested every opportunity for investigating the financial and physical conditions of the companies. A circular was sent on December 16 to the 29 municipalities served. There is yet no public indication as to how it will be received by them.

Viaduct for Bethlehem

Plans have been completed by the bridge engineer employed by Bethlehem, Pa., Clarence W. Hudson, for a viaduct or bridge across the valley, with its railroads, which lies between Bethlehem and West Bethlehem. The bridge will be connected with streets by means of 8 ramps and the total length is something over 6,000 feet. The bridge proper will have a width of 64 feet. Facilities are afforded for island platforms for connecting the Lehigh Valley, Reading and Central Railroad tracks with the bridge by means of inclined planes and stairways. There will be 11 reinforced concrete arch spans of varying lengths and two steel spans over the railroads. The plan originally proposed was of the spandrel arch type, but calculations showed that the cost could be reduced by substituting the filled arch type, and the latter was adopted. Considerable thought has been given to other changes looking to reducing the cost to a minimum consistent with absolute safety and serviceability.

Power from Colorado River

Application has been accepted by the Federal Power Commission for a preliminary permit to develop 2½ million horse power from the Colorado river, the application being that of the Southern California Edison Co., which plans to distribute current through California, Utah, Arizona, Nevada and Colorado. There will be a storage basin more than 200 miles long impounding more than 40 million acres-feet of water. Incidentally, the damming of the river would tend to eliminate its seasonal floods. The total possible hydroelectric development of the river is calculated at more than 4 million horse power.

Government Aid for British Roads

The British Ministry of Transport has offered to contribute 50 per cent of the cost of constructing roads and streets in British cities, and in addition to loan to the municipalities the remaining 50 per cent for five years, repayable in annual installments. Ex-service men receive preference among applicants for employment on the road work, but all applicants are required first to submit to one week's registration at the established labor exchanges, in order to eliminate floating labor. So far work amounting to more than $7,000,000 has been undertaken by the cities of Bristol, Liverpool, Dundee, Manchester, Aberdeen and ten other cities, while 8 additional ones are considering similar unemployment schemes requiring expenditures of about $2,500,000.

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Snow Fighting in City and Country

A few years ago only the largest cities thought it necessary to remove snow from their streets, and then only from the principal thorouhfares. With the increase of motor traffic and especially of motor truck traffic, however, the importance of uninterruption in the transportation of goods has become so vital that not only all of the main traffic streets in every city of size or importance, but even the main highways through the country districts,, must be kept open during the winter if embarrassment to business and financial loss to merchants is to be avoided.

In this issue we present the latest ideas in connection with the removal of snow from city streets. Next week we expect to supplement this with another article dealing with keeping open the main highways of the country during the winter season, with special reference to the practices of the several state highway departments.

Elements of an Attractive Contract

The absolutely imperative requirements for every contract should be honesty and fairness in letter and in spirit. If in addition there is open-mindedness, consideration and prompt and efficient fulfilment of all obligations on the part of the owner and engineer, the contract should be acceptable to any good and competent contractor who desires to execute this class of work. Usually the work may be expedited, the cost reduced, the duties of the engineers and inspectors made easier and simpler, the owner better served, and the contract made much more desirable to the contractor, even to the point of justifying a lower bid, if, in writing the contract and specifications and in carrying out the agreement, special attention be paid to a number of features that are often the cause of difficulty or unfair conditions and treatment.

The contractor should never be held responsible for the design or for the maintenance and operation of the work. The work should be kept entirely free from political influence. The drawings, specifications and contract should be clear, concise, positive and exact, and should contain no contradictions or ambiguity. Nothing in them should be capable of contradictory interpretation. Classifications should be made thoroughly and carefully.

The necessary drawings should be furnished well in advance of the time that they are required for use. All changes should immediately be specifically covered by full descriptions, drawings and written orders. All designs, specifications and schedules should be co-ordinated to permit the work to be executed in the most advantageous sequence, without delay or interference and at the most seasonable times.

Unnecessary precision in the execution, and too minute accuracy should be avoided. The use of standard methods, operations, materials and plant should be promoted. Standard sizes and commercial articles should be used to the exclusion of special ones when practicable. The use of local resources should be permitted where available. Unnecessary refinements should be eliminated. Materials and workmanship should be suited to the reasonable requirements, thus permitting second class to be advantageously used where first class is not necessary.

Very elaborate or extensive work can often be classified for more advantageous construction under several separate contracts. Where very large quantities of materials or supplies are required they may often be advantageously furnished to the contractor by the owner, thus insuring quality and delivery, and eliminating profits on market prices. Plant and equipment necessary for several contractors may often be advantageously furnished by the owner, as in the case of his building a service road to supply a long line of construction, furnishing power from a central plant, or developing aggregate for concrete. If the survey or investigation of local conditions is difficult,

costly or prolonged, it should be made by the owner's engineers and supplied to all of the invited bidders, thus elinimating duplication of costs.

Estimated quantities and specific data should be guaranteed in many cases, with specific provision for their increase or decrease. Provision should be made for necessarily unbalanced bids and for important increase or decrease of quantities when such changes may seriously affect the contractor.

In a unit price contract, automatic changes should be provided for important items subject to great fluctuation. Responsibility for damages should be very clearly stated. Penalty clauses should be balanced by bonus clauses. Elements of uncertainty not dependent on the contractors' skill or resources should be assumed, as much as possible, by the owner, thus removing unnecessary risks to the contractor.

If the contract is not a lump sum or unit price agreement, great care should be given to provide in advance for a fair settlement for differences of payment corresponding to changes in design or quantity. Good results will often be obtained by providing for the contractor to share a certain proportion of any saving in the execution of the work. Controversies should be settled by a third party and solely on their merits. The retained percentage should be reduced as the work nears completion. Moderate surety bonds should be required. Open shop work should be insisted on.

More Immigrants Needed

The terror of European immigrants to this country which has been carefully nursed and the frantic demand for the absolute prohibition of immigration or for drastic laws controlling it are founded neither on facts nor on a basis of reasonable probabilities. They are largely dangerous propaganda of professional agitators of the labor unions that aim to absolutely monopolize labor as a class trust and to continue dictatorship of the same quality defined by the Adamson law and the Plumb railroad bill. It is their policy to create by any means the utmost scarcity of labor so as to enforce their extortionate demands for high wages and inefficient services. To do this they have skilfully inspired a vast amount of hysterical and irresponsible newspaper statements, and are exerting every possible ounce of political pressure.

The important facts that require neither argument or proof, are that all necessities and commodities in the United States have been greatly depleted by the war during the last six years, that normal production and industry of every sort have been reduced and have not yet regained standard conditions, so that we have not only failed to make up any considerable part of the great deficits, but, as we are not yet functioning up to the average, are still falling farther and farther behind. Production and improvement are still losing ground and high prices and unsafe conditions continue.

At no time has there ever been a serious or Previous to the war there was a steady and constantly increasing immigration of over 1,000,000 per year that supplemented the necessary supply of labor and was relied upon and necessary. The cessation of this supply and the further loss of hundreds of thousands of emigrants from this country during the war has seriously diminished the never excessive amount of labor available until now there is far less than enough for normal requirements while we are confronted with much more than normal necessities to regain our position to say nothing of the tremendous increase that we should have to conduct the unprecedented export business that awaits and almost demands development.

There is no labor surplus in this country to-day. The very small amount of local unemployment is due to business depression and the reaction from extravagance and chiefly to the inefficiency of labor itself that cannot forever compel capital to pay several times the real value of services. The moment that improvements and general construction are resumed in anything like the necessary degree, there will be great and dangerous shortage of labor. If it is not relieved, great loss and still more dangerous and unsettled conditions will result.

The trouble can be relieved only by admitting large numbers of selected immigrants; no matter how much they are encouraged, they will be needed before they can arrive, and any present diminution of the supply is a serious injury to the country.

We now have the choice of the sturdy and most valuable workers of the world in large quantities. It only remains to select the most desirable ones and distribute them where they should go and to exclude the undesirable ones. We principally need unskilled labor who will in nowise lower the standard of living or compete with efficient skilled labor, or according to high authority, materially lower wages. On the contrary, their presence will make for more work for skilled employees and mechanics. Abundant facilities should be organized for inspecting, selecting and directing them at points of embarkation; a supplementary organization should be provided at Ellis Island, and those accepted should be classified, distributed and rapidly and systematically Americanized. The literacy test which excludes many capable workers and never excludes the radicals and agitators should be abolished and more stringent means taken to detect and exclude Bolshevists and their class.

A large proportion of the present increase of immigration that is causing so much needless alarm is composed of dependants that will not affect the labor market but will tend to stabilize the relatives already here who are good workers and are returning to their old jobs.

Congress will do well to consider these facts impartially and, refusing to deprive ourselves of the necessary commodity that is offered us, will devise means to secure and use it most abundantly and advantageously.

Some 1920 Census Figures

Growth of large, medium size and small municipalities during the last decade compared with that of former decades. Some individual instances of phenomenal gains and of losses in population.

Final official figures have not yet been published for the complete population returns as obtained by the 1920 census, but we have obtained through the courtesy of the Census Bureau figures for all cities of 5,000 inhabitants or more, subject to correction before final certification. It is probable that there will be no material changes made in these, and certainly none large enough to in any way alter the general conclusions as to trend of population as shown by them.

CITIES OF 25,000 POPULATION AND LARGER

We first notice that the number of cities of 25,000 population or more has increased from 226 in 1910 to 288 in 1920, an increase of 62. In the previous decade, from 1900 to 1910, the increase was 65—approximately the same.

The increase in population, however, has not been so great. The cities which entered this group between 1900 and 1910 had an average population of about 16,000 at the beginning of the decade, while the cities which entered the group between 1910 and 1920 had an average population of 18,700 at the beginning of that decade. Expressed in another way, the increase in population of all the cities which had a population of 25,000 or more in 1920 was 36.4 per cent in the first decade and 27.6 per cent in the second decade. If we include in the total for each census of 1900, 1910 and 1920 only those cities which at that census had a population of 25,000 or more, we find the increase in population living in cities of 25,000 or more was 44.3 per cent between 1900 and 1910 and 29.0 per cent between 1910 and 1920. In 1900 the population living in cities of this size was about 26.1 per cent of that of the entire country, in 1910 it was 31 per cent, while in 1920 this had increased to 34.7 per cent.

Examining the figures in detail, we find some interesting and curious developments in the growth of certain individual cities. For instance, a number of cities which increased considerably in the decade of 1900 to 1910 lost in population during the decade of 1910 to 1920; while on the other hand, some of the cities which gained in the latter decade had lost in the previous one. For illustration, Pueblo, Colo., gained about 58 per cent in the former decade but lost 3.3 per cent in the latter. Newport, Ky., gained 7.1 per cent in the former but lost 3.3 per cent in the latter decade. Salem, Mass., gained 21.5 per cent in the former decade but lost 2.7 per cent in the latter. Others in the same class are Joplin, Mo.; Hoboken, N. J.; Troy, N. Y.; and Superior, Wis. Manhattan Borough of New York City had gained 26 per cent in the former decade, but lost 2 per cent in the latter, although the city as a whole gained 17.9 per cent in the latter decade.

In the other class we find that Cicero, Ill., after losing 10.7 per cent of its population in the former decade gained 209.1 per cent in the latter. Chelsea, Mass., lost 48 per cent in the former decade, but gained 33.1 per cent in the latter. St. Joseph, Mo., lost 24.8 per cent in the former, but gained 0.7 per cent in the latter, by no means restoring it to its original population. Altogether five cities in the list lost in population during the decade of 1900 to 1910, while nine lost in the decade of 1910 to 1920.

Some illustrations of phenomenal growth are shown in this twenty-year period. Miami, Fla., had a population of 1,681 in 1900, 5,471 in 1910 and 29,549 in 1920. Tampa, Fla., also grew from 15,839 to 51,252 during the two decades. Hamtramck, Mich., did not exist in 1900, had 3,559 in 1910, and had 48,615 in 1920. Highland Park, Mich., increased in the two decades from 428 to 46,499. Irvington, N. J., increased from 5,255 to 25,840. Newark increased from 246,070 to 414,216. West New York, N. J., increased from 5,267 to 29,926. East Cleveland, Ohio, at the three censuses in question had populations of 2,757, 9,179 and 29,292, respectively. Lakewood, Ohio, had populations of 3,353, 15,181 and 41,732. Tulsa, Okla., had populations of 1,390, 18,182 and 72,075, an increase of more than 5000 per cent. Portland, Ore., increased from 90,426 to 258,288. Bethlehem, Pa., increased in the last decade from 12,837 to 50,358, probably due largely to the stimulation of the steel industry because of the war. Knoxville, Tenn., more than doubled in population during the last decade or from 36,436 to 77,818. Wichita Falls, Texas, increased from 8,200 to 40,079 in the last decade. Washington cities increased from 120 per cent to 216 per cent between 1900 and 1910, but during the last decade increased only from a nominal increase of 35 persons in the case of Spokane to a maximum of 33 per cent in the case of Seattle. Clarksburg, W. Va., had populations of 4,050, 9,201 and 27,869 at the three census periods. California probably showed a more remarkable growth between 1900 and 1910 than any other state, Berkeley increasing 206 per cent, Long Beach 691 per cent, Los Angeles 211 per cent, Oakland 124 per cent, Pasadena 232 per cent, San Diego 124 per cent, and all of the others more than 21 per cent. During the last decade, Long Beach was the only one to increase more than 100 per cent, its increase being 212 per cent. San Diego came next with 88.7 per cent, then Los Angeles with 80.7 per cent, Fresno 79.2 per cent, Stockton 73.3 per cent, Pasadena

49.7 per cent, Sacramento 47.3 per cent, Oakland 44.1 per cent, Berkeley 38.2 per cent, San Jose 36.8 per cent, and San Francisco last of the cities of the state, with 21.9, thus falling behind Los Angeles, having a population of 508,410 as compared to 578,673 for the latter city.

PLACES OF 10,000 TO 25,000

Considering the cities of from 10,000 to 25,000 population, we find that there were 264 of these in 1900, 346 in 1910, and 472 in 1920. The total populations of the cities in this class at each of the three censuses was 4,120,678, 5,215,820 and 7,147,329, respectively. This shows an increase of population living in cities of this class of 26.5 per cent between 1900 and 1910, and 37 per cent between 1910 and 1920. In the latter decade the increase in population is due to some extent to the greater number of incorporated places included in the successive censuses. If we take the population of all the places included in the 1920 census, we find that the population of these increased by 37 per cent between 1900 and 1910, and 24.5 per cent between 1910 and 1920. In 1900 the per cent of the total population which lived in cities of this class was 5.4 per cent, in 1910 it was 5.6 per cent and in 1920 it was 6.6 per cent.

In this class also we find certain individual cities losing in population during the 1910-1920 decade, including 1 in Arkansas, 1 in California, 2 in Connecticut, 1 in Florida, 2 in Indiana, 3 in Iowa, 2 in Kansas, 3 in Massachusetts, 5 in Michigan, 1 in Mississippi, 2 in Montana, 1 in New Hampshire, 5 in New York, 2 in Oklahoma, 8 in Pennsylvania, 2 in Rhode Island, 1 in Vermont, 1 in Washington, and 2 in Wisconsin. This shows a total of 45 incorporated places of 10,000 to 25,000 population which lost in population in this decade, while in the previous decade the total number was only 24 for the entire country.

PLACES OF 5,000 TO 10,000 POPULATION

The incorporated places of from 5,000 to 10,000 population numbered 415 in 1900, 551 in 1910 and 746 in 1920. The populations at these three censuses were 2,854,540, 3,829,740 and 5,177,162, respectively. This shows an increase of 34 per cent in the former decade and 35 per cent in the latter decade in people living in incorporated places of this size. If we consider all of the places included in the last census, we find the increase was 36 per cent between 1900 and 1910, and 25 per cent between 1910 and 1920.

Considered in relation to the entire population, we find that in 1900 3.8 per cent of the total population lived in incorporated places of from 5,000 to 10,000 population, 4.2 per cent in 1910 and 4.7 per cent in 1920.

As is natural, we find percentages of increase in the decade considerably greater in the small places of from 5,000 to 10,000 than in the large cities, since a comparatively small number of new residents means a considerably higher percentage of growth. A very considerable number of these small incorporated places in all sections of the country are found to have increased more than 100 per cent, apparently the highest percentage growth being that of Eastland City, Texas, with an increase of 995.7 per cent. This illustrates the previous statement, however, since the actual increase in population was only 8,513. In the cities of this class the largest total decrease in population was that of Webb City, Mo., which lost 4,010 from a population in 1910 of 11,817. The greatest increase in population was that of Eastland City, Texas, the total increase being 8,513, this being also the highest percentage of growth, as previously stated.

The greatest number of incorporated places of from 5,000 to 10,000 population are found in Pennsylvania, there being 93 such places in that state. The next largest number is found in Massachusetts, with Illinois third; while Ohio, Michigan, New Jersey and New York run very close for fourth place. Of places of 25,000 population or more Massachusetts leads with 27, New York follows with 22, New Jersey and Ohio each have 21, and Pennsylvania 20, Illinois has 17, Michigan 14, and Indiana 12. Rhode Island, one of the two smallest states in the Union, contains five cities of more than 25,000 population, six of between 10,000 and 25,000, and eight of between 5,000 and 10,000. Delaware, the other smallest state, contains one city of more than 25,000 population, and no other incorporated place as large as 5,000.

RELATION OF URBAN TO TOTAL POPULATION

Cities of more than 25,000 population contained 26.1 per cent of the entire population of the country in 1900, 30.9 per cent in 1910, and 34.7 per cent in 1920. This shows a slight decrease in the rate of growth of the larger cities as compared to the growth of the entire country, while for the places of the two smaller classes the rate of growth has increased.

Considering all the cities of 5,000 population or more, we find that in 1900 35.1 per cent of the population lived in such places, in 1910 40.7 per cent and in 1920 46.0 per cent. If we consider all incorporated places, of which there are more than 14,000 smaller than 5,000 population, we find a little more than 60 per cent of the population living in these places. This is the population generally referred to in statements on the subject as being urban population. A great many incorporated places of 1,000 or less, and even many of 2,000 or 3,000 population, are living under conditions which would seem to be those of the country rather than of the city; and if we draw the line at about 5,000, we find that less than half of the population of the country has yet moved to places of this size, although if the movement continues at the present rate from country to city, the next census will find somewhat more than 50 per cent of the population living in places of more than 5,000.

Creates Park to Save Tree

At the time of grading Main street in Visalia, Cal., a majestic oak tree was left standing in the street, and, fearing that it might be cut down by some future officials, a small plat of ground about

it was made into a public park surrounded by a concrete curb. This was named Askin park after a former mayor of the city and his wife was appointed the official custodian. This is believed to be the smallest public park in the United States.

Simplifying Zoning

By George B. Ford and E. P. Goodrich*

What zoning should and can secure, its legal limitations. East Orange's recent zoning ordinance.

Following the successful example of New York, already a dozen cities have adopted "zoning ordinances," at least thirty are well advanced, and a hundred more are on the point of starting.

Zoning is the "best seller" among civic improvement ideas to-day, because it gives the city a far-reaching control over the use and development of private property, to the great benefit of the public; all for virtually nothing.

In New York City the increased taxes based on the benefits arising from the zoning law have already paid the cost of drafting the ordinance and maps several times over. Millions are being saved in transit extension because now at last the engineers know exactly the kind and amount of development possible in each section of the city.

St. Louis claims it would have saved two and a half million dollars in the extension of its sewer system had the zoning been in force earlier. Water system extension, paving programs, even fire protection and school programs in New York, St. Louis and Newark are showing marked savings, thanks to a definite plan of growth for the city.

The real protection against a selfish neighbor which zoning affords is already improving the marketability of property in New York. The home-seeker or the business man is less hesitant to build because he can now know what surroundings to count on. He no longer has to fear the erection of a factory or a garage next door nor a four-story apartment, built out on the street line, cutting off his light and air.

Zoning spells orderliness. A place for everything and everything in its place. It is exactly the same principle applied to the city as a whole, that the good housewife applies in the home. It means carrying out scientifically for the whole town various sorts of restrictions on private property. Some of these are similar to the private restrictions so useful in suburban developments, but the comprehensive laws have the great additional advantage of being under the "Police Power" of the state and of being permanent.

Other features of the laws keep factories or unduly tall or voluminous buildings from invading good business streets.

Zoning conserves all that is best in existing conditions or tendencies and provides for a logical development. It can do more. It can actually direct the growth of the city along the best lines. By studying at the same time as zoning the development of the thoroughfare systems, transit rerouting and extension, railroad relocation, elevation and terminal development, waterways development, playground, parks and parkway development and related problems, the zoning of private property can be so co-ordinated with it that the control exercised will become a dynamic factor for improvement.

However, to be accepted by the courts, a zoning ordinance MUST be reasonable. It must be comprehensive, with a system of logical restrictions covering every part of the city. It must not be piecemeal, nor must it be too complicated.

Experience with the operation of existing ordinances shows that zoning can be simplified. For example, New York City has three separate zoning maps with an aggregate of 14 different kinds of districts. Other cities throughout the country have anywhere from 10 to 19 different kinds of districts. In the proposed ordinances for East Orange these have been reduced effectively to six types of coterminous districts which are readily combined on one map.

We have found that the fire limits which necessarily belong with the building code can be made coterminous with certain zoning districts and therefore can be superimposed on the one map.

Heretofore building lines have been set back only under the power of eminent domain. Several zoning ordinances have tried to force new buildings to set back from the street line a distance equal to the average setback of all of the existing buildings within the block frontage. However, no court and few lawyers have recognized this principle as within the purview of the police power. The East Orange ordinance establishes a new kind of setback building line, whereby for each type of district it establishes uniform front-yard provisions which correspond to the uniform back-yard and side-yard provisions and are equally justifiable with the latter under the police power.

Since the famous Cusak case in Chicago was settled, even billboards can be regulated under the police power. They are more objectionable in residence districts than in business districts and more in the latter than in industrial zones. Therefore we find that it is reasonable to exclude them altogether from strictly residential districts and to regulate them more severely in business than in industrial districts.

Zoning should enhance the attractiveness and the social well-being of the community. The studies along these lines that were started eight years ago in New York are now showing most interesting results in practice. The appearance of streets is becoming more orderly. Large sections of New York are beginning to settle down to a harmonious development, all of which engenders self-respect.

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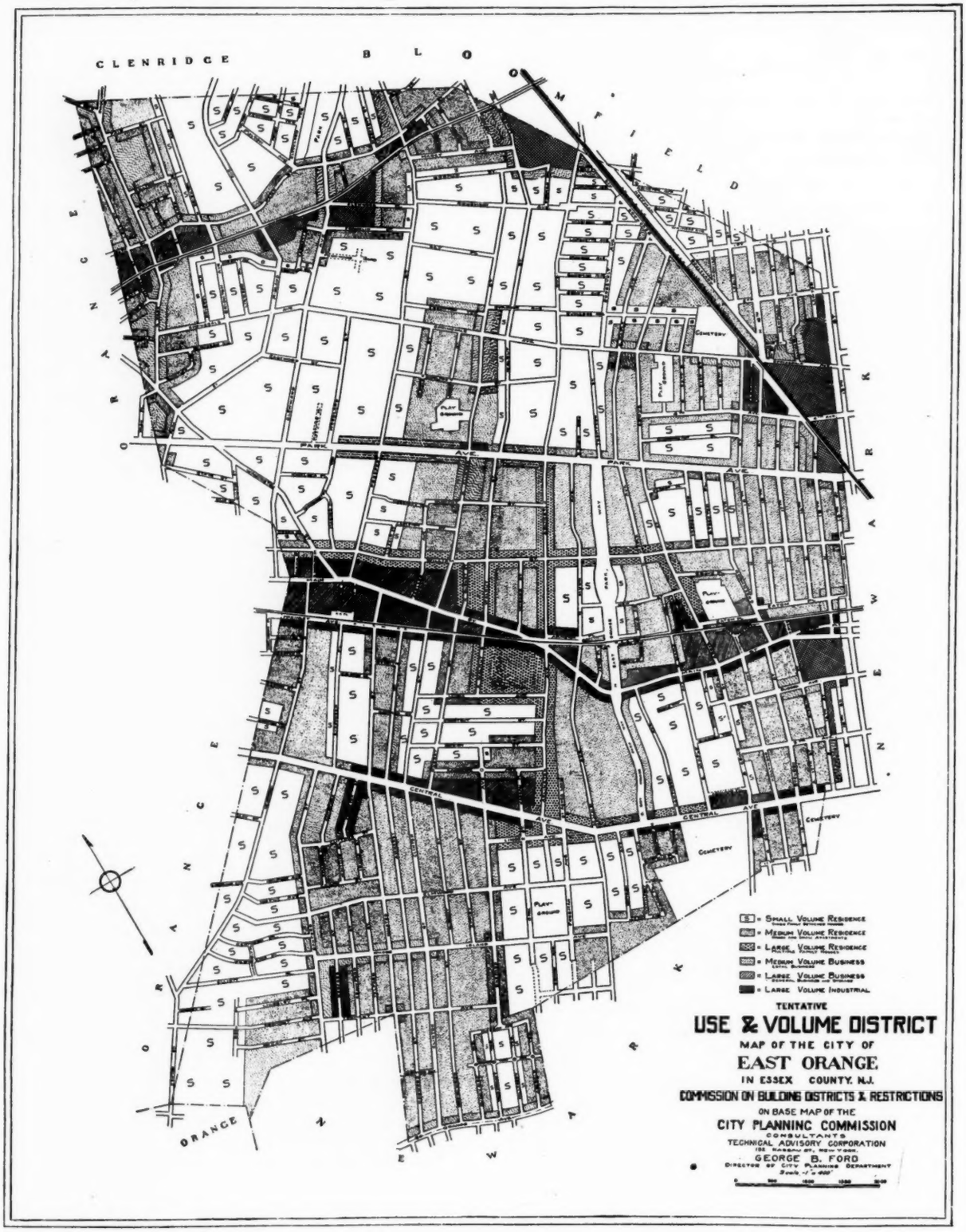
In most cities it is now necessary to consult many ordinances and to have plans for even the smallest building alteration approved by from three to seven different bureaus before actual work can start.

In East Orange two ordinances will now cover everything that has to do with building—all that was formerly contained in seven or eight different ordinances. The building code will cover everything that has to do with the control of building construction and with fire prevention. The zoning ordinance will cover everything that has to do with the use of buildings, their height and area and their exterior layout, including their location on the lot.

One of the weakest points in the New York



law lies in the number of matters which are left to the interpretation and discrimination of the Board of Appeals. Anything that can be done to state in the ordinance itself under just what conditions garages or nuisances may be permitted in certain districts will be of the greatest advantage. Thus the East Orange ordinance states definitely that garages shall be permitted in local or general business districts, provided they are made to conform to certain regulations in the text of the law which control effectively most of their objectionable features.

Obviously zoning must not be arbitrary. It must be based on a thorough study of local conditions by men who know from experience what to look for. The specialist must know the pitfalls and adapt the principles that operate well elsewhere to local conditions. He must consult constantly with local men who know all of the ins and outs. He must take the public into his confidence and not dictate. Only thus can a zoning ordinance be effective and reasonable.

Asphalt Paving Specifications Free

In the November 20 issue we described specifications for asphalt pavements issued by the Asphalt Association and stated that we supposed these might be had from the association upon request. The secretary of the Asphalt Association, J. E. Pennybacker, requests us to inform our readers that this supposition was correct and that the specifications will be furnished free of charge upon request addressed to the association at 25 West 43d street, New York City.

Removing Snow from City Streets

Methods used by different cities for removing or otherwise handling snow, including melting; municipal cleaning of sidewalks; mechanical appliances used for removing snow.

Information concerning methods employed and recommended for removing snow from the streets of American cities was obtained and compiled recently by the New York State Bureau of Municipal Information. This included information concerning methods employed in a number of cities, which was obtained by the bureau by correspondence; further information concerning methods employed by traction companies obtained by R. C. Cram, engineer of the Brooklyn Rapid Transit system; and in addition, reports of New York City and the Rochester Bureau of Municipal Research, papers and discussions at the meeting of street cleaning officials held in Philadelphia in 1914; from "Municipal Engineering Practice," by A. P. Folwell; from lectures to postgraduate students at Yale, by Leon F. Peck of Hartford, Conn.; and finally a description of several pieces of mechanical apparatus which have been used or tried for this purpose.

Of the smaller cities reporting, the majority use the old method of shoveling the snow into sleighs and carting it to a river, vacant lots, or wherever else it can be dumped. Carting in sleighs, however, is found to be slow work, partly because of the generally small capacity of the sleigh and partly because of the time required for shoveling the snow out of the sleigh, and dump wagons or dump trucks are preferable for these reasons. In the case of deep drifts, however, powerful tractors cannot force their way if the snow is allowed to collect. Buffalo found that during the heavy storm last winter a steam tractor of 20 tons capacity with a plow attached could not force its way through the drifts, and hand labor became necessary.

Several cities deposit the snow in the rivers by means of manholes in the bridge floors through which the snow is dumped, among these being Binghamton and Auburn, N. Y., and St. Paul, Minn.

In Geneva, N. Y., a heavy timber is put through the hind bob of a bob sleigh and drawn through the residential streets, thus packing the snow. In the business streets a scraper is used next to the curb.

Buffalo places snow fences in the outskirts of the city where there is more or less vacant land and estimates that they have saved the city thousands of dollars.

In most of the larger cities the street railway companies are required to do more or less snow removal. In most cases this consists of brushing the snow from the tracks and for a foot or two beyond. In Niagara Falls the street car company uses plows that are furnished on one side with a blade about 9 feet long, leaving a fairly clear roadway on the tracks and for 9 feet on each side.

Niagara Falls uses what it calls snow removers, which it found more efficient than trucks. They are built of timber about 8 feet wide and carry approximately a wagon load of snow. They are self-loading and self-dumping and if the haul is not too long will remove snow much more rapidly than several trucks, and require the services of but two men, a driver and an operator.

Yonkers, N. Y., last winter found it difficult to keep up with the snowfall, and ice was formed to

considerable depth with the alternate thawing and freezing of the snow. Some of this was broken up for removal by using a steam roller with heavy picks in the rear wheels.

In Rochester, where there is considerable use of sleighs, the Bureau of Municipal Research recommended that certain streets be designated for sleigh traffic and that the snow be left not only on the roadways of such streets but also at the crossings of these streets with the intersecting ones so that sleighs would not become stranded on the car tracks and congest traffic, as has frequently happened.

Sidewalks.—Several cities pay more attention to the thorough cleaning of sidewalks by the city than to the removal of snow from the roadways. Jamestown, N. Y., uses snow plows for clearing the sidewalks, hiring men owning horses. The city last winter was divided into 32 routes. When it snows during late afternoon or night the police department calls these men on the 'phone, usually about 3 a. m., and the sidewalks are usually cleared by the time the first workers appear about 6 or 6:30. About 200 miles of sidewalks are cleaned in this way. If the sidewalk plows are called out during the day the call is given by the superintendent of streets. Niagara Falls has 15 sidewalk scrapers, each operated by a man and horse, which are started to work when the snow reaches a depth of about 2 inches. The scrapers were kept constantly at work day and night during the past winter until sidewalks had all been cleaned up. This method of cleaning sidewalks is reported to be not entirely satisfactory because the city has not yet been successful in obtaining scrapers that will cut close to the sidewalk pavement, and the result is that snow and ice build up on some sidewalks to a depth of 6 or 8 inches. The walks are always kept passable, however.

Melting Snow—Baltimore reported that the government tried the use of flame burning on the snow, but found it entirely unsatisfactory. Other methods of using heat have been tried, including the use of electricity, steam, hot water, oil burners and flame throwers. J. T. Fetherstone found by test that one pound of anthracite coal would melt a little over one cubic foot of loose snow at a cost of $.29½ per cubic yard, as compared with $.24 for truck hauling and $.12 if sewers are used. It is stated that using electricity would require one kw. h. for melting each 25 pounds of snow. An oil burning flame projector invented by L. V. Stevens has been tried on the Canadian Pacific Railroad, the device throwing an incandescent flame some ten feet ahead of the truck. No statement was made as to its efficiency.

The United States Commerce Reports described recently a machine used in the city of Helsingfors, Finland, which would burn wood, coke, coal, kerosene or crude oil. An apparatus weighing 500 pounds and requiring four men to keep it supplied with snow and fuel and using 200 pounds of coke an hour, melted 32 cubic yards of snow in that time. The apparatus consists of an iron furnace, water jacketed all around, a snow receiver or hopper, and a contrivance in which the heat in melted snow is used in assisting in the melting of further snow. Dirt and gravel in the snow are automatically separated from the water to avoid clogging drains or gutters. The machine is said to be used in Finland by street cleaning departments and private property owners. According to the figures just given, one of these machines would remove a one-foot snowfall on a 60-foot street at the rate of 340 feet a day of 24 hours, using 2.4 tons of coke. To clean the 600 miles of streets which New York City is arranging to keep clean this winter would require 10,000 such machines working one day and employing 112,000 men, or 1,000 machines and 11,200 men working for 10 days and burning 24,000 tons of coke. This, of course, is out of the question.

Sewers.—A number of cities have made more or less use of sewers for removing the snow, dumping it into them through manholes, but only during the past four or five years has this shown indications of becoming a general practice. Now most of the cities which are supplied with storm sewers or others of a diameter of 24 inches or larger and with a sufficient velocity of flow and comparatively short run to the river or other point of discharge have adopted this method. These cities include Albany, Buffalo, New York, Niagara Falls, Poughkeepsie and Yonkers, N. Y.; Baltimore, Md.; Cincinnati, Ohio; Newark, N. J.; St. Louis, Mo.; Worchester, Mass.; and undoubtedly other cities.

MECHANICAL APPLIANCES

The past two or three years have seen considerably more extensive use made of mechanical contrivances of one kind or another than had been seriously considered in the past. "In fighting the blizzard of 1920, almost every conceivable type of mechanical apparatus was used. Auto trucks with plows attached in front were successful in some cities. Tractors were employed to push plows or drag graders, scrapers and scarifiers. Rotary plows attached to tractors or to electric street cars proved successful in clearing portions of the street for traffic. In New York a flame thrower was devised and attached to the front of a motor truck. Locomotive cranes with huge buckets and also steam shovels were found effective in Boston and New York. Snow melters were tried in other cities. According to a committee which investigated a demonstration of the Friedman snow tank in New York City, this gave promise of being the most successful of all types of mechanical apparatus for the rapid removal of heavy snowfalls." (This tank was described in Public Works for May 8, 1920.)

"Steam shovels gave effective service in several Eastern cities. In Springfield, Mass., Keystone traction steam shovels, used on snow removal work, were run in 12-hour shifts right through the 24 hours. The same type shovel also was used in New York City. In the latter city the Anorac Engineering and Contracting Corporation which, with other organizations, was pressed into the service of the city in this snow removal emergency, moved its Keystone grader

from an uptown excavating job into the business district and placed it at work loading snow into trucks. The first day it was impossible to get an adequate supply of fuel for the grader, the hauling conditions were so bad. It was also impossible to keep the grader supplied with trucks fast enough to keep it busy, so that the first day it was idle about half the time, but nevertheless removed about 272 yards (city measurement) of snow. Traveling conditions did not improve the second day and, while the number of trucks was increased, the grader still was not working to capacity. As the snow was gradually removed and hauling conditions improved the output of the grader was correspondingly increased until February 14, when a maximum output of 439 yards (city measurement) was reached. The measurement by the city of trucks for the snow removal allowed what is called a heap measurement of 6 feet over the top area of the truck. Most of the trucks have been filled at least 2 feet over the top area, for which no allowance is made in this measurement by the city. The contractors considered that the grader took the place of at least 50 laborers during this entire work of snow removal, even considering the time lost through unforeseen difficulties."

The rotary snow plow has been used by some Canadian cities with satisfactory results. It consists of four blades 22 inches in diameter driven by a 60 horse power gasoline engine mounted on sleds and drawn by horses. The blades are driven at a speed of 500 revolutions a minute and discharge the snow through deflecting hoods on one or both sides of the machine. The apparatus cuts a path 5½ feet wide and will work in snow up to 6 feet deep. It leaves about 6 inches of snow on the roadway for sleigh traffic. In Westmount and Outremount, where these were used, it was estimated that the machines could remove snow from a cut 5 feet wide and 4 feet deep at the rate of $20.79 a mile. It cleaned a 10-foot path 21 inches deep at the rate of 2,258 feet a day and at a cost of 3.7 cents a cubic yard, this including fixed charges for repairs, interest and depreciation. "Such a machine appears to be very useful for opening up traffic where there is sufficient room in the street to permit the snow to remain adjacent; but where snow must be removed the expense would be greatly increased."

SYSTEM ADOPTED FOR NEW YORK

We have already described, in our issue of September 11, the trucks and other mechanical appliances which have been purchased by New York City this year for snow fighting. The committee appointed to report on the subject in 1920, after naming the kinds and numbers of apparatus which it thought desirable, gave a description of the general plan for using the apparatus, which was as follows:

"As soon as a snowfall starts and the commissioner is convinced—after consulting with the Weather Bureau officials—that it will be a continued storm, he will issue orders to have the tractors and trucks begin work. The plows shall be attached to the trucks at the various garages, and the police, fire and street cleaning operators who are assigned to this work shall immediately report for duty and proceed at once to the points where they are to plow.

"The scheme, as outlined, is to have plows in teams of two clean a width of 20 feet of roadway for a distance of three lineal miles in one hour and to continue working over such a route after the snow has ceased falling. The average rate of snowfall is ½ an inch per hour and the motor-driven plows operating at the rate of three miles an hour will cover the entire area every two hours, constantly plowing one inch of snow on each trip up and down the assigned area.

"With 150 tractors and 250 five-ton trucks operating, all of which will have snow plows attached, starting at 200 different points and covering three lineal miles, cleaning 20 feet of roadway, it will be noted that the department will—with its own equipment—have plowed at the cessation of snowfall in each storm six hundred miles of roadway in the important sections of the city, 70 per cent of which will be in the Borough of Manhattan, so that there will be no interruption of traffic such as practically paralyzed the trucking business last year and incurred the loss of millions of dollars.

"This force will be augmented by the hiring of auto trucks to which department snow plows will be attached and it is estimated that 100 of these will be engaged in working in the same manner as the Department trucks and tractors covering an additional 150 miles of roadway. It is intended that this total force will be operated within one hour after the call has been issued by the commissioner, so that if the storm is in progress one hour and it is decided to call out the forces, all the equipment will be in motion within two hours after the storm starts, or in other words, the full force of motor trucks and tractors will be operating when the snow shall have reached a depth of one inch.

"The first point in the work on snow removal is to keep traffic moving. This will be accomplished by throwing the snow from the center to the sides of the roadway. The second point is to have the snow removed as quickly as possible after it is thrown to the sides. For this purpose it is intended to utilize the 100 two-ton department trucks and the department force of carts, approximately 500 in number, on the first day of each storm to haul the snow to the most convenient disposal points, such as sewers and water-front dumps.

"During the progress of a storm, the laborers will be assigned to work at the same time that the call is issued for the plows to start out and they will pile the snow just as soon as it is thrown to the side of the roadway by the plows. This will obviate delay as formerly occurred while waiting for the contractors' forces to begin work, which was usually delayed until the following day.

"The Street Cleaning Department intends to remove the snow with its own force south of 14th street, in the Borough of Manhattan, where the

greatest difficulty developed last year, and to extend its forces, wherever practicable, north of 14th street on the main thoroughfares, such as Fifth avenue, Broadway and other main arteries of traffic, so that the snow will be removed with all possible speed.

"It is purposed to utilize the plows attached to the tractors to push snow from the roadways to the sewer manholes wherever such are available, after they stop plowing, which means that 150 tractors will be pushing snow on all streets where sewers are available and in this way great quantities will be removed quickly.

"The plans also provide for registration of the emergency men in advance of the winter season in order to have an available snow fighting force of laborers report at the 103 section stations throughout the three boroughs, at which places they will be equipped with picks, shovels and pan scrapers; and under the direction of squad leaders, they will be assigned to certain routes for sewering or piling the snow, depending upon the type of sewer adjacent to the various points at which they are assigned to work.

"The rates of pay to attract a sufficient number of laborers for snow work will be determined later in the year, depending upon what a survey of the labor conditions will indicate. As it is intended to make every effort to have the snow removed quickly, a raise in the rates would seem to be one of the means of inducing laboring men to report promptly in sufficient numbers to get the work done rapidly and at a minimum expense, for it is easier to handle the snow immediately after it has fallen than to permit it to be pressed down by the traffic and hardened by freezing."

In a lecture before post-graduate students at Yale University on January 9, 1920, Leon F. Peck, superintendent of streets of Hartford, gave some recommendations for snow removal methods best adapted to conditions usually existing in cities of 200,000 population. He recommended the snow fighting rather than snow removal method for business districts, the use of sewers where practicable, and stated that it was practicable before the war to obtain men for snow removal at the rate of about 2½ to 4 per thousand population, which would give approximately 25 men and 15 teams for each mile of street from which it is customary to remove snow. He concluded by stating:

"Experience indicates that the following methods or rules can be recommended:

"Emergency work should be done under direct control of the city on a day labor basis, rather than by contract.

"Teams and trucks secured by telephone or messenger, from list of owners on file.

"Extra men secured through the regular street cleaners, who should be trained by the foremen to send all the men they can to force organizing headquarters whenever their experience tells them that extra men are needed.

"Emergency foremen should be selected from the list of regular city foremen and inspectors of repairs, road construction, grading, street sprinkling, street lighting, forestry, etc., who are all or in part usually, in cities of this class, under the one street department responsible for snow removal.

"The city's first aid should be directed towards the principal congested center and toward opening up fire department streets to the railway track streets.

"There is little or no financial advantage gained in attempts to use sewers for snow disposal if water fronts and vacant lots are available at practically no greater haul.

"Cities making long hauls and having sewers 18 inches or more in diameter in snow removal sections should surely give the method a trial, with the aid of a hydrant stream if necessary. Economy snow removers, so called, which are simply a large horse-drawn scoop, can be used on short hauls.

"Special openings provided in the floor of bridges are good if the haul can be shortened thereby and the traffic is not too congested for such a provision.

"Road scrapers, either horse-drawn or motor-driven, can be used in clearing pavements, opening gutters, or in piling snow in ridges for removal or in leveling ridges for sleighing.

"All surplus snow thrown from the tracks of street railways should be leveled and pushed toward the curb by the company, using a 14 to 16-foot spreader board 3 feet high attached to the snow plow and adjustable at any angle.

"Gondola or other types of freight cars can be used on the street railway tracks for hauling snow after midnight, and in some cases can be used during the day by closing a few blocks to street railway passenger traffic if the cars can be sent around the closed blocks on the next parallel street."

A 117-Mile Section of Concrete Highway Completed

The longest stretch of concrete paved road that has yet been completed under the Federal Aid Act was formally dedicated and opened to the public at Mason City, Ill., December 23. The completed pavement is a 117-mile link in the Chicago-St. Louis highway. It is the first large project to be completed of the 4,800 miles of hard-surfaced roads that are to form a connected and statewide system of highways in Illinois.

For the most part, the road follows section lines, but there are frequent jogs and many turns. Where these turns are less than an eighth of a mile, new locations have been made and easy reverse curves put in their place. All right angles have been reduced to curves having a radius of not less than 205 feet and the curves are super-elevated or banked one inch to the foot, making them safe for traffic at good speed. All curves have good visibility so that approaching cars may avoid meeting head-on at turns.

Construction Questions Answered

Suggestions as to methods, "wrinkles" and appliances that may be used to overcome difficulties arising in construction work. We invite questions concerning such problems that may arise from time to time in the experience of any of our readers. Answers prepared by competent authorities will be published promptly. It is hoped that others who have solved similar problems differently will send us their solutions for publication also; or describe new "wrinkles." If it is only a new way to drive a nail, it may help some one.

How Can Concrete Sheet Piles Be Installed?

Design and installation of plain and reinforced, pre-cast and cast-in-place types. Hollow steel units of very thin steel driven without injury and concreted. Continuous walls made with very thin interlocked joints.

Where permanent sheeting is required, steel sheet piles, especially those with thin webs, are objectionable because of corrosion that will impair them and eventually destroy them under many conditions. Wooden sheet piles may be subject to rapid decay if not continuously submerged, or in sea water they may be quickly and completely destroyed by teredos; besides which, they are difficult to install and subject to serious injury where the driving is hard. All of these objections may be overcome by the use of concrete or reinforced concrete sheet piles.

For long lengths, the piles will need reinforcement in order to enable them to be handled with safety if they are of the pre-cast type. If they are of the cast-in-place type, they will not need reinforcement unless it is requisite to give them the necessary section modulus.

ADVANTAGES OF CONCRETE SHEETING

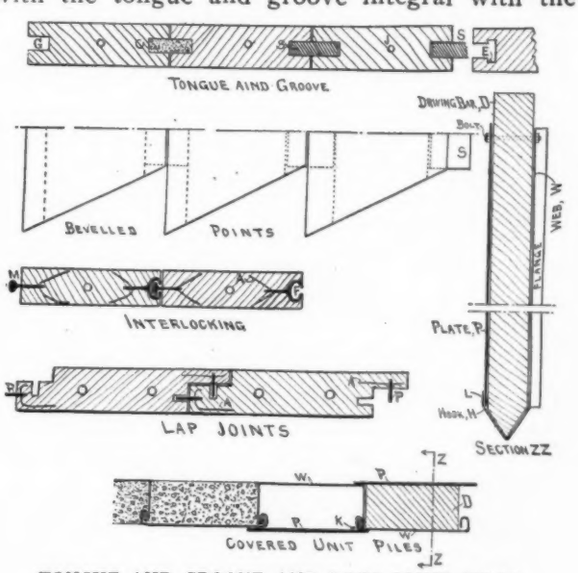
In many suitable places where sheeting is used to retain the sides of excavations, or where it is important to prevent any bleeding or subsequent displacement or settlement of the adjacent soil (as is often the case in trench work in city streets or in excavations close to important foundations or other substructures in quicksand or treacherous soil), or where the sheeting cannot be removed after the excavation is backfilled on account of the displacement occasioned by the movement of the soil to fill up the voids left by withdrawing the sheeting, concrete piles would often be suitable and sometimes as cheap or cheaper than satisfactory wood or steel piles.

In other cases, such as bulkhead walls, wing walls, abutment walls, and many kinds of retaining walls, the thicker concrete piles forming a continuous permanent structure may be economical and suitable and possess the great advantage of being installed without excavation, pumping, or bracing, and may often be substituted by the contractor for some other specified type of construction if a satisfactory design is submitted, and the contractor is able to install them advantageously.

Pre-cast concrete sheet piles have been successfully used in a number of cases but they were generally of large dimensions involving considerable cost in casting and handling and very heavy and extensive driving. When the driving is hard it imposes very heavy impact on the concrete, which often injures them, is objected to by many engineers, and requires slow, costly and difficult operations. Some of these troubles may be avoided by concreting the piles in place by simple, easy methods that have been perfected, but have been little used for this purpose. These methods require driving with the same plant and operations as are used for ordinary wood, steel, or concrete piles, and when applied to the pre-cast methods have the advantages of more economical execution and of eliminating injury and uncertainty in the finished construction. In both cases, ordinary standard hammers or hydraulic jets are used.

TONGUE AND GROOVE PILES

The tongue and groove type is, except the plain, rectangular section, disconnected units, the simplest of pre-cast sheet piles, and may be made with the tongue and groove integral with the



TONGUE AND GROOVE AND LOCK JOINT PILES

pile or, usually more advantageously, with each unit provided with two grooves G and one wooden spline S. After driving, the splines may remain permanently in position or they may be withdrawn and the grooves thus vacated may be filled with concrete, uniting adjacent units. If desirable to provide a positive interlock, the inner ends of the grooves may be enlarged by extension E, which will key the concrete in position.

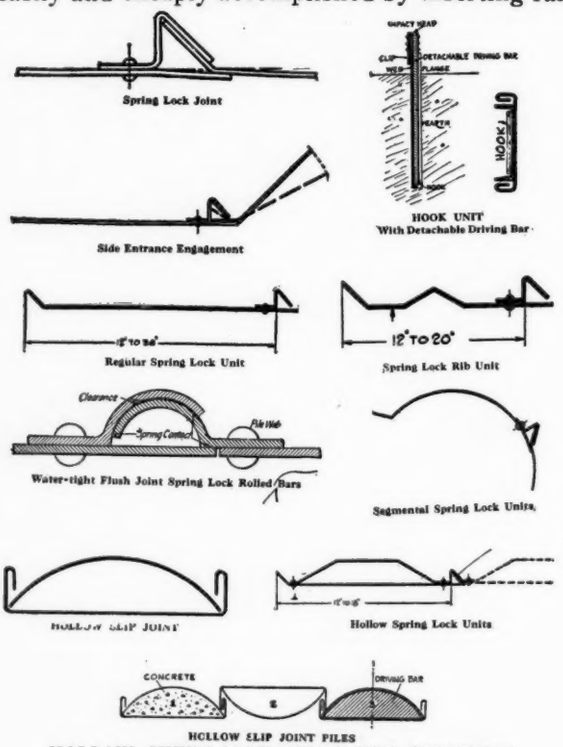
The bottoms of the pile units should be beveled to make them draw together in driving, and there may be one or more full-length jet pipe holes J, cored in each pile unit to facilitate the use of hydraulic or pneumatic pressure in installation.

LOCK JOINT PILES

Pre-cast piles may be provided with regular steel sheet-pile interlocks for the installation joints. These interlocks may be of any available type and are easily and economically provided by splitting a standard steel sheet pile through the center longitudinal line, punching holes through the web of each portion, and casting the male and female members M and F, of the joints, in the concrete, as indicated in the sketch, with bent anchor bars A passed through the punched holes. One sheet pile 12 inches wide will thus provide for the interlock of a concrete pile unit two or three times as wide.

LAP JOINT PILES

A very simple type of concrete sheet pile is made with a ship-lap joint that, if carefully installed, will serve in many cases without any method of interlocking. If it is desirable to provide a positive interlock for this type, it can be easily and cheaply accomplished by inserting full-length projecting plates P, in the transverse and longitudinal faces of the joints to engage corresponding recesses in the adjacent units. These piles can be cast, like most of the other types, in very simple forms and have no delicate projections subject to special injury in driving. Like the other types, they can be provided with jet holes and should have their lower ends beveled to draw together in driving.



HOLLOW SHEET PILE UNITS FOR CONCRETE CONSTRUCTION

Details of their elements, and sections illustrating application of driving bar.

CAST-IN-PLACE SHEET PILES

Concrete sheet piles can be installed under any conditions where it is possible to drive a rugged, solid wood or steel pile of the same dimensions, by a combination of the hollow sheet pile unit and driving bar principles. The hollow sheet pile of either the Spring Lock or Slip Joint type can, under favorable conditions, be made of any required dimensions and of extremely thin metal, even as light as 18 or 20 gauge, the limitation usually being the stiffness required for the projecting joint member to be safely driven. This enables the steel weight and cost to be reduced to a very small amount and permits the steel to be left permanently in the ground without involving serious expense.

The spring lock hollow pile can be made with the end entrance or the side entrance joint, and with bent or rolled joint bars, the former being usually much cheaper and more convenient. With the hollow piles the joints are not enclosed in concrete and form exposed sections of the completed structure which may eventually become impaired or destroyed, leaving narrow spaces between the concrete units themselves, a contingency that is not likely to happen for many years and then probably not until after subterranean conditions have been so permanently established that it may not be injurious.

In both cases the lower end of the pile web projects beyond the flanges and is bent 180 degrees to form a hook H, or pocket engaging the lower end of a solid wood or steel driving bar, somewhat longer than the pile unit, which receives the impact of the hammer, relieves the steel pipe of all stress except tension, and is removed as soon as the pile has been driven to required penetration. This provides a very substantial chisel edge that is not injured by encountering ordinary obstacles, can cut through or displace many of them without impairing the integrity of the steel pile, and is entirely independent of the subsequent concreting.

COVERED UNIT PILES

The covered unit type of concrete pile possesses several features of great superiority that make it convenient, economical and extremely desirable for either heavy or thin sheeting where a perfectly regular flat construction of absolute uniformity and integrity is required.

For thin sheeting it is made with ordinary slip joint pile units, all of which are duplicates. Each unit is driven with a driving bar engaging the hook bottom and the lip L, of the hook is extended far enough to cover the lower end of a detachable back plate P, covering the face of the driving bar opposite to the pile web W. As each

successive unit is driven, the web of the slip joint pile is inserted at K, between the cover plate and the joint flange of the previous pile, thus making the steel construction continuous on both sides. The plate P, covering the channel shape hollow of the assembled pile, makes a completely enclosed rectangle which, after the withdrawal of the driving bar is filled with concrete. After the concrete has set the detachable plate P can be withdrawn and used again, in which case it is usually made of heavy metal, but if it is desired to retain it permanently in position it may be made of very thin metal and thus reduce the cost of steel. If reinforcement is required, any desired amount may be assembled and placed in position after the driving bars have been withdrawn.

If the thickness of the sheet pile is considerable it may be more economical to fabricate the steel slip joint piles with two separate patterns, one having very narrow flanges and the other having flanges as wide as the full thickness of the required sheeting, thus locating the interlocks near one face of the pile and using only one thickness of metal for the bulk of the flange instead of the four thicknesses that would be required if all of the flanges extended across the full width of the sheeting.

With this type of sheeting, if the steel eventually disappears entirely through corrosion the integrity of the sheeting will be in no way impaired except by the negligible loss of the interlock, which is chiefly necessary for installation purposes.

The rights to use the patented slip joint, spring lock joint and driving bar features are easily obtained, and the steel piles, weighing, according to width, 3 pounds or even less per square foot of web, can be fabricated from standard commercial sheets at any place where a bending brake of adequate capacity is available, by two or three men, at the rate of 50 to 400 square feet per hour, according to dimensions.

Immigration Notes

Notwithstanding the reports of excessive immigration that are used to justify the support of restrictive measures, the number of alien emigrants from the United States has until now for a long time exceeded that of the immigrants, causing, last year, a decrease of 10,138 in our alien population. During the last fiscal year ending July 1, there were admitted to the United States, exempted especially from the head tax, contract labor law and literacy test, a total of 21,895 laborers from Mexico, West Indies and Canada, all engaged for agricultural work.

Chinese immigration, although still very light, showed an increase of about 1,350 over the number for the previous year. Statistics show that the proportion of females in the total number of immigrants is this year 42.4 against an average of 33.5 for the four years previous to the war. In the ten years previous to the war there were admitted 1,617,018 aliens that would at the present time be debarred by literacy tests.

Dispatches from Warsaw report great numbers of immigrants, largely Russians and Jews, in a destitute condition and infected with disease, that are passing through Poland en route for the United States.

Frederick A. Wallis, immigration commissioner at Ellis Island, states that more than 3,000 immigrants are coming to Ellis Island almost daily and that the arrivals for the fiscal year 1920-1921 will be more than 1,000,000. He estimates that more than 10,000,000, probably 15,000,000, are now waiting in Europe to come here but that they are not all immigrants in the strict sense of the term, many of them being refugees from the war-burdened countries. He estimated that at least 8,000,000 Germans are ready to immigrate here, that 3,500,000 Italians are also ready, and that even the Dutch are immigrating by thousands.

Commissioner Wallis says that "we undoubtedly need a great many of these people, but when our country is in the process of readjustment it undoubtedly would be a good thing if we could establish some sort of differential selection scheme for the admission of these immigrants, excluding the barterers, and the lazy classes that mostly make for radicalism. At present most of them are going to the large cities and should be distributed throughout the country." Mr. Wallis ended by saying "when in doubt, deport."

The tendency toward lower wage scales has become more marked. Reports of reductions in wages of common labor come from all parts of the country, and appear to be confined to no particular industry. Textile mills generally may be said to have reached a lower wage level, and the movement is progressing in the iron and steel and metal mining industries.

Resistance on the part of workmen to lower wage scales is not much in evidence. There are as many instances of voluntary offers on the part of workmen to accept reduced rates as there are of refusals. On the other hand, a few demands for further increases are reported, mostly incident to negotiations for the renewal of agreements.

The Southern Pine Association's Weekly Trade Barometer reports that for the week ending December 24 the production from 105 mills was 30,914,790 feet as compared with a normal production of 73,918,812, showing a production 58.18 per cent below normal. Reports from 84 mills show that during this week 18 were shut down completely, 6 operated one day each, 16 operated two days each, 3 operated three days each, 13 operated four days each, 18 operated five days each and only 10 operated on full time.

Recent Legal Decisions

VALIDITY OF SIDEWALK CONTRACT—ALTERNATIVE AS TO MATERIALS

The Indiana Appellate Court, Indiana Truck Farm Co. v. Town of Schneider, 128 N. E. 617, holds that resolutions for the construction of a sidewalk were not void for uncertainty because they required the sidewalk to be laid on a suitable foundation of "cinders, sand or other equivalent material," and that it be made of crushed stone or gravel. The alternative as to materials did not affect the substantial quality of the walk, and merely gave the owners and contractors an option to use the most available material.

The contract was not void as against public policy because it provided that the contractor was to establish grades and make cuts according to the directions of the engineer, where it also provided that the direction of the engineer was to be according to the plans, profile and specifications, and therefore there was no delegation of discretionary powers to the engineer.

POWERS OF MUNICIPALITIES TO CONSTRUCT IMPROVEMENTS BEYOND LIMITS

In general, a municipality is competent to act beyond its boundaries only in those cases in which it is so empowered by legislative authority, and it is necessary, in passing upon the validity of acts of a municipality performed beyond its boundaries, to look to the general laws and municipal charters for the requisite authority. In certain instances, owing to the urgency of extreme expediency or necessity, express authority is dispensed with and the power of the municipality to perform certain acts beyond its boundary is implied as incidental to the existence of other powers expressly granted. Thus, it has been said that, where a municipality has power to construct sewers, it may, as an implied incident to such power, extend the same beyond its boundaries when necessarily or manifestly desirable, as, for example, to obtain outlets. Likewise, a municipality possessing power to supply its inhabitants with water may acquire for that purpose a water supply without its territory. And certain municipalities have been held authorized to supply light and water to points beyond their boundaries.

Where a city proposed to issue bonds for the construction of a pleasure pier and jetty on its water front, which would extend beyond the city's limits, the proceedings being taken under California St. 1915, p. 99, providing for the formation of districts within municipalities for the acquisition or construction of public improvements "therein," the California Supreme Court held, Mulville v. City of San Diego, 192 Pac. 702, that the statute denies power to construct or acquire such an improvement beyond the boundaries of the district, "therein" meaning in that place.

INJUNCTION OF SALE OF PROPERTY FOR SIDEWALK TAX REFUSED

The Iowa Supreme Court holds, Matson v. Mitchell, 179 N. W. 173, in a suit to enjoin a sale of realty for a sidewalk tax and to cancel the tax, where the principal ground relied on by the plaintiff was that the permanent walk was not built on the permanent grade, and that no such grade was established, the burden of proof was on the plaintiff. The mayor and town council, acting in good faith, passed a resolution ordering the plaintiff to construct the sidewalk. This was known to him, and he knew they were constructing it, with the intention of assessing the cost against his property. He stood by and without objection allowed the town to finish the work and pay the contractor. Plaintiff having the burden, it was presumed, in the absence of evidence to show that the assessment was not according to benefits, that there was some benefit and that the amount determined by the council should be allowed to stand. The plaintiff by his conduct was estopped to enjoin the sale.

EXPERT TESTIMONY AS TO THE UNFITNESS OF SEWER MATERIAL HELD INADMISSIBLE AS IMPROPERLY BASED

In a contractor's action against a village to recover under a contract to construct a sewer from vitrified segment block, taken over and completed by the village under the claim that the material and workmanship were defective, the Michigan Supreme Court, Porath v. Highland Park, 179 N. W. 229, reversed a judgment for the plaintiff and granted a new trial for the erroneous admission of expert evidence that vitrified segment block sewers had been failures in certain cities in the United States and Canada, followed by the opinion of the expert that such failures were due to the unfitness of the vitrified segment block for such purposes. This testimony raised collateral issues which it was very difficult for the village to meet. It raised an issue as to each sewer mentioned, whether it was constructed under similar soil and other conditions, whether the blocks were similar in quality, and after this whether the failure was due to defective material or poor workmanship.

It was held, however, that the contractor could not be held responsible for the use of particular blocks passed under the inspection and by order of the engineer, the contract providing that the work was to be done to the satisfaction of the village engineer and village council; and that evidence that the village engineer had passed certain materials was admissible on the question of whether the work was done according to the contract notwithstanding the council refused to approve. Failure to get the approval of both would not preclude him from showing that his work had the approval of one of them.

NEWS OF THE SOCIETIES

Jan. 10—HARTFORD BRANCH, CONNECTICUT SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. City Club, Hartford, Conn.

Jan. 11—TOLEDO SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Toledo Commerce Club.

Jan. 11-13—ASSOCIATED BUILDING CONTRACTORS OF ILLINOIS. 808 Chamber of Commerce Building, Chicago, Ill.

Jan. 14—COLUMBUS SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Engineers Club, Southern Hotel.

Jan. 17-18—OHIO STATE ASSOCIATION OF BUILDERS' EXCHANGES. Ohio Hotel, Youngstown, O.

Jan. 18—WATER POWER LEAGUE OF AMERICA. First annual meeting. Engineering Societies' Building New York City.

Jan. 18-20—IOWA ENGINEERING SOCIETY. Annual meeting. Des Moines, Ia.

Jan. 19 — INTERNATIONAL CUT STONE CONTRACTORS' AND QUARRYMEN'S ASSOCIATION, Inc. Annual meeting. Congress Hotel, Chicago, Ill.

Jan. 19 — AMERICAN SOCIETY CIVIL ENGINEERS. New York City.

Jan. 25 — ATLANTA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Joint meeting with Atlanta Section, A.S.C.E. Carnegie Library.

Jan. 25 — PHILADELPHIA SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Engineers Club of Philadelphia.

Jan. 25-27 — MICHIGAN ENGINEERING SOCIETY. STATE ASSEMBLY OF THE A.A.E., Detroit, Mich.

Jan. 25-27—CANADIAN NATIONAL CITY PRODUCTS ASSOCIATION. 19th annual convention. Carls-Rite Hotel, Toronto.

Jan. 25-27 — THE AMERICAN WOOD PRESERVERS ASSOCIATION. Place of meeting to be announced later.

Jan. 25, 26, 27—ASSOCIATED GENERAL CONTRACTORS. Annual meeting, New Orleans. Secretary's Office, Washington, D. C.

Jan. 28 — COLORADO SECTION, AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Metropole Hotel.

Jan. 31-Feb. 5—NATIONAL BRICK MANUFACTURERS' ASSOCIATION AND COMMON BRICK MANUFACTURERS' ASSOCIATION OF AMERICA. Joint meeting. Hotel Pennsylvania, New York City.

Feb. 1-2—NEW YORK STATE ASSOCIATION OF BUILDERS. Convention. Rochester, N. Y.

Feb. 1, 2, 3—ONTARIO PROFESSIONAL MEETING in conjunction with the annual meeting of the Engineering Institute of Canada. Toronto.

Feb. 7-8—FLORIDA ENGINEERING SOCIETY. Annual meeting. Lakewood, Fla.

Feb. 9-12 — AMERICAN ROAD BUILDERS' ASSOCIATION. Eighteenth annual convention, eleventh American Good Roads Congress and twelfth National Good Roads Show, Coliseum, Chicago, Ill.

May 17-19—NATIONAL FIREMEN'S ASSOCIATION. Twenty-third annual convention. Fort Wayne, Ind.

June 7-9—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting. San Francisco, Cal.

June—CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS, State of N. Y. 12th Annual Conference. Elmira, N. Y.

June 6-10, 1921—AMERICAN WATER WORKS ASSOCIATION. Annual convention at Cleveland, Ohio. Secretary, J. M. Diven, 153 West 71st St., New York.

THE NEW ENGLAND WATER WORKS ASSOCIATION

The annual meeting of this association will be held at Copley Square Hotel, Boston, on January 12, 1921. Besides routine business there will be, at 11 a. m., meeting of the executive committee at the headquarters, Tremont Temple. 1 p. m., lunch will be served at Copley Square Hotel. 2 p. m., reports of committees: "Standards of Purity for Water," Mayo Tolman, chairman; "Revision of Constitution and By-Laws," Henry V. Macksey, chairman; "Standard Specifications for Cast Iron Pipe and Special Castings," Frank A. McInnes, chairman; "Standard Specifications for Fire Hydrants," H. O. Lacount, chairman; "Statistics of Water Purification Plants," George C. Whipple, chairman; "Leakage of Pipe Joints," Frank A. Barbour, chairman; "Standard Specifications for Water Meters," Charles W. Sherman, chairman; "Proposed Standard Schedule for Grading Cities and Towns of United States with Reference to Their Fire Defenses and Physical Conditions," Frank A. McInnes, chairman; "A National Water Law," Caleb M. Saville, chairman; "Extension of Mains," Caleb M. Saville, chairman; "Pumping Station Records," A. O. Doane, chairman; "Watershed Losses," Robert E. Horton, chairman; "Investigate Discrimination in Rates Charged by Fire Insurance Companies against Water Works Pumping Stations and in Favor of Electric Power Stations," Gorham Dana, chairman; "Standardization of Brass Fittings," David A. Heffernan, chairman.

Regular order of business: Report of the secretary; report of the treasurer; report of the editor; report of the auditors; annual address of the president; election of officers—report of tellers appointed to canvass ballots; meeting of 1921 executive committee.

Henry V. Macksey, president; Frank J. Gifford, secretary, 715 Tremont Temple, Boston, Mass.

AMERICAN ASSOCIATION OF ENGINEERS

$500 has been appropriated by the executive committee of the American Association of Engineers from the national treasury to assist in the prosecution of the Pihlfeldt-Young case against the city of Chicago. These two men claim that they were discharged from their respective positions of bridge engineer and assistant bridge engineer without sufficient cause. The Chicago chapter of the A. A. E. is raising a fund to assist in prosecuting the case, and this appropriation from the national association will be paid to the executive committee of the Chicago chapter as needed, and at such times as are approved by the national executive committee.

The American Association of Engineers has appointed a committee of seven engineers to study and report on the various bills presented to Congress for a department of public works. The members of this committee are: George W. Hand, assistant to the president of the Chicago & Northwestern Railway, Chicago; Morris Bien, assistant director of the United States Reclamation Service, Washington; W. L. Benham, consulting engineer, Kansas City; A. N. Johnson, dean of engineering in the University of Maryland, College Park, Md.; Dr. Frederick H. Newell; W. A. E. Doying, chief inspecting engineer of the Panama Canal, Washington; and Dr. A. D. Morehouse, consulting engineer, Washington.

The report of the committee on preferred activities for 1921 recommends: 1. Endeavor to raise level of engineers' salaries. 2. Support Public Works Bill. 3. Support state license law. 4. Increase efficiency of employment system. 5. Promotion of social features in local chapters. 6. Incorporate business education in "Professional Engineer." 7. Increase membership systematically. 8. Manager form of city government. 9. Budget system at national headquarters. 10. Membership to take active part in legislation. 11. Make local chapters more effective. 12. Co-operation with other societies.

In connection with the conference on employment and education held by the American Association of Engineers on November 12, a brief questionnaire was sent to educators and engineers asking for their opinion as to whether engineering, legal and other professional college courses should be preceded by one or two years of general collegiate training. Out of the 154 replies received, 99 were in favor of two years of general education, 43 were in favor of one year and only 12 were opposed to any general collegiate training in addition to the professional course. Fifty-four of the replies were from deans, professors or instructors in engineering colleges and the balance were from consulting engineers, chief engineers and other engineers.

At a joint dinner of the Memphis Chapter of the American Association of Engineers and the Memphis Engineers' Club on December 20, given in honor of a delegation of state legislators, the lawmakers were informed of the contents of two bills prepared for introduction before the recent session of the legislature. One provides for a department of sanitary engineering in the state board of health and the other provides for the licensing of engineers and architects. Several prominent engineers and architects spoke in favor of both bills.

A campaign to find positions for professional engineers thrown out of positions on account of slacking up of engineering work has been undertaken by the Oregon Chapter, which has appropriated a sum of money to be spent within the next three months in advertising in newspapers and magazines. County commissions will be asked to go ahead with some of their work instead of waiting until spring, and other methods will be pursued.

EXECUTIVE BOARD, FEDERATED AMERICAN ENGINEERING SOCIETIES

A meeting of the executive board of the Federated American Engineering Societies was held in New York on December 17, which was presided over by Herbert Hoover, president of the society. Every member of the council was present with the exception of A. M. Greene, and two new members of the board were elected, W. B. Powell and Gardner S. Williams. The following standing committees were appointed: Procedure—Calvert Townley, chairman; Herbert Hoover, ex-officio; W. E. Rolfe, D. S. Kimball, J. Parke Channing, L. W. Wallace and L. P. Alford; Constitution and By-Laws —W. B. Powell, chairman; C. F. Scott and D. S. Kimball; Publicity and Publications—L. P. Alford, chairman; H. W. Buck and H. E. Howe; Membership and Representation—J. E. Oberlin, chairman; L. W. Wallace and A. S. Dwight; Finance—William McClellan, chairman; E. Ludlow, C. Townley, L. W. Wallace, ex-officio; Public Affairs—J. Parke Channing, chairman; Fred J. Miller, L. B. Stillwell.

The immediate program of the council was then considered. Mr. Hoover stated that engineers all over the country seemed to want to join the federation movement, but that the trend was for territorial organization, rather than national. A committee was appointed to look into this matter. It was decided that the American Engineering Council is not to affiliate with the United States Chamber of Commerce. The matter of publicity was then taken up and $1,000 was authorized by the council as an initial fund to carry on publicity work.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

The annual meeting of the American Association of State Highway Officials was held in Washington December 13-16. Traffic problems, including the regulation of vehicle loads, classification of roads and road types in relation to traffic service value were discussed. Foundation design and structure were emphasized as the primary construction problems of the future.

The opening address was by the Hon. E. T. Meredith, Secretary of Agriculture. He announced that he had urged Congress to enact immediate legislation to continue federal aid beyond June 30, 1921, when the aid provided by the present act terminates. Thomas H. MacDonald, chief of the Bureau of Public Roads, then summarized the federal-aid work. A resolution was submitted by C. M. Babcock, Minnesota, calling upon the executive committee, with the aid of a supplementary committee of five, to urge upon Congress the enactment of federal aid legislation.

Traffic problems were next considered. The first paper was one on "Traffic Census," by A. N. Johnson, who commended the practice of Maryland which is distinguished by the careful classification of vehicles, some twenty classes being recorded. A. W. Dean, Massachusetts, took exception to this, holding the classification as too complex, and advocating just five classes. The whole weight of the traffic and not the number and classification of the vehicles is the important question. Uniform state laws limiting the loads on vehicles were then urged by C. J. Bennett of Connecticut. Thomas Maddock, Arizona, and J. N. Cole, Massachusetts, took active part in the discussion which followed on this subject. Methods of regulating vehicle loads were then proposed by J. A. Mackall of Maryland.

The next topic for discussion was road structure. Papers were read by A. T. Goldbeck, C. M. Upham, A. R. Hirst, W. D. Uhler and Clifford Older, all indicating a pronounced trend of thought toward greater consideration of foundation construction and less concern about types of surfacing. An improvement in railway transportation of road materials is predicted for 1921.

W. R. Neel of Georgia urged modification of contract requirements to meet the present conditions. He told of the successful experience this season with a cost-plus contract. F. S. Greene of New York took a stand in favor of the cost-plus contract, which, he said, would encourage contractors and offer opportunities for economy.

Three resolutions were passed all calling for federal aid of some sort. These were: the continuance of federal aid on the basis of present legislation with certain modifications; appropriations by the Secretary of Agriculture of money for research on the basis of equal appropriations by the state; and legislation providing for further distribution of surplus war materials.

MINNESOTA JOINT ENGINEERING BOARD

At a meeting on November 27 the Minnesota Joint Engineering Board elected the following officers: President, Adolph F. Meyer; vice-president, H. T. Downs; secretary-treasurer, Hans J. Meyer. Six societies have ratified the constitution of the proposed Minnesota Federation of Architectural and Engineering Societies.

IOWA ENGINEERING SOCIETY ANNUAL MEETING

The annual meeting of the Iowa Engineering Society will be held at the Chamberlain Hotel in Des Moines on January 18, 19 and 20. Every indication points toward a very successful meeting. A feature of the occasion outside of the usual technical and social program will be the manufacturers' exhibit.

There are now approximately 1,200 registered engineers in the State of Iowa. This fact coupled with the fact that the state legislature meets in Des Moines in January is arousing unusual interest in this meeting.

COMING MEETINGS OF LOCAL SECTIONS OF AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Jan. 18—BOSTON, Joint meeting with the Boston Section of the A. I. E. E. Mr. W. S. Murray, of the Super Power Survey, on the Super Power System.

Feb. 8—Water Power Development and Stand-by Steam Stations as applied to the general subject of Power Development in New England.

Feb. 28—PHILADELPHIA, at the Engineers' Club of Philadelphia. Prof Dexter S. Kimball, Consulting Engineer, Ithaca, N. Y., on "A Broader Field for the Engineer."

PERSONALS

Andrews, Harry C., former resident engineer, Boone county, W. Va., highway department, is now assistant engineer of public roads, Raleigh county, W. Va.

Lesage, Thomas W., for thirty-three years in the service of the city of Montreal, and recently consulting engineer to the water works department, has resigned, effective January 1, 1921.

Cloney, Thomas, formerly city clerk, has been appointed city manager of Vicksburg, Mich.

Smith, L. B., district secretary of the American Association of Engineers, represented the engineers in New York at the invitation of Mayor Hylan, and in Chicago the association was represented by R. C. Bailey.

Stoner, K. S., chief of the valuation department of the Terminal Railroad Association of St. Louis, has been appointed by President Sherman of the American Association of Engineers on the National Railroad Council of the A. A. E., to succeed Mr. Winship of St. Louis, who has resigned.

Strong, William J. H., of the Lake Breeze Motor Co., of Chicago, president of the Chicago chapter of the American Association of Engineers, will address the Ohio Engineering Society on January 12.

Brown, G. Chester, chief mining engineer for the California Industrial Accident Commission, has been elected president of the San Francisco chapter of the A. A. E., to succeed William S. Wollner. The chapter now has 646 members.

Greene, G. B., general manager of the General Supply Co., of Canada, Ltd., was re-elected president of the Ottawa branch of the Association of Canadian Building and Construction Industries at the annual meeting a short time ago.

LeClair, Georges C., has been appointed superintendent of the incinerator department of the city of Montreal, to succeed J. E. Nantel, who is retiring.

Howard, Norman J., bacteriologist in charge of the filtration plants of the city of Toronto, has resigned in order to accept a position as manager of the water works department of the General Supply Co., of Canada, Ltd.

Graeser, C. F., formerly resident engineer on design and construction of municipal improvement work with W. B. Saunders, consulting engineer, Helena, Mont., has accepted a position as assistant engineer, Minnesota Highway Department.

Phillips, Hiram D., assistant division engineer, Massachusetts State Department of Public Works, Bureau of Highways, has been appointed engineer of District No. 2, Franklin and Hampshire counties, Conn., to succeed C. H. Howes, resigned.

Klorer, John, vice-president of the New Orleans Chapter of the American Association of Engineers, has been appointed city engineer of New Orleans.

Peabody, Lionel Henry, Jr., civil engineer, who at two different times was in the employ of the Rhode Island State Highway Department, died on November 15, at Shawomet, R. I.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

HAUCK CONCRETE HEATERS

Oil-burning heaters made by the Hauck Manufacturing Company are illustrated in their bulletin No. 130, which deals chiefly with heaters intended to be used for concrete placed in cold weather. The successful application of the Hauck devices to a number of important construction jobs are there described and illustrated.

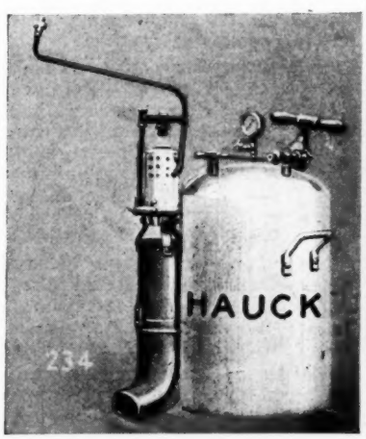
A heater that is used with any type of concrete mixer has a kerosene oil burner that produces an intense flame projected by air pressure into the interior of the mixer in operation, where it maintains the temperature of the aggregate uniformly at 90 degrees or higher if required, thus eliminating the necessity for heating the water or aggregate in advance.

The heater equipment consists of a compressed air tank and a burner, shown in the engraving at the left, which is connected to it by a flexible pipe with additional lengths of steel pipe if necessary. The burner is attached to the framework of the concrete mixer and the lower end is inserted in the charging hole. It requires very little attention and can be operated by any ordinary workman. It is made in two sizes provided with hand pumps which need operation only once in three hours, and burns from two to three gallons of kerosene per hour. Best results are obtained from an air pressure of 40 to 60 pounds. Larger tanks are furnished when the air can be received from a compressor.

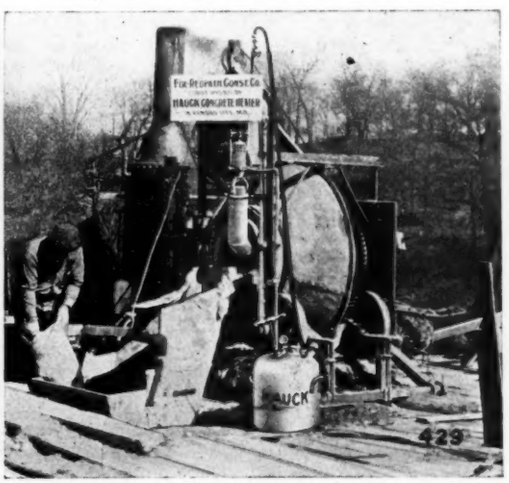
Thawing machines consisting of a Hauck burner connected to a small tank with a hand pump are recommended for thawing out ground preparatory to excavation, for foundations, and for laying concrete floors and melting ice and snow around frozen forms, etc. A few minutes' operation of the hand pump will provide pressure for three hours. A contractor laying conduit, with 2½ feet of frost in the ground, thawed out 300 linear feet in an 8-hour day. One of these machines is also able to thaw out a frozen sand, gravel or stone car in from 1 to 3 hours.

The kerosene salamander has a Hauck burner delivering a great volume of intense heat to a perforated cone that has a larger radiating area than any coal or wood-burning salamander and can be operated without danger of fire to adjacent wooden forms. It is made in three sizes consuming from two to three gallons of oil per hour.

Hauck burners are also used for illuminating purposes, and give a clean white flame free from smoke, that will not flicker in the wind or draft. The company also has manufactured an easily installed high-pressure type furnace burner that will burn any grade of oil when supplied with steam or compressed air at 20 to 100 pounds pressure, and is recommended for raising steam in boilers for the engine, hoist and crane. The burner lights easily without pre-heating and is easily regulated, it can be set to work by gravity or under pressure or by siphonage. It is manufactured in four sizes with an oil consumption of from one to twenty-five gallons per hour and with an air or steam consumption of 8 to 20 cubic feet per minute.



HAND PUMP TYPE OF BURNER

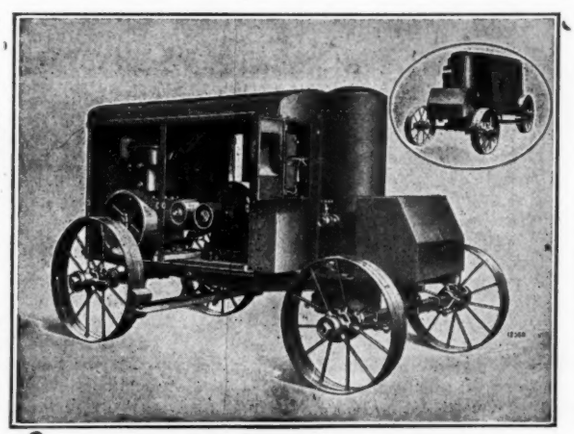


A No. 90 HEATER ON A ½-YARD MIXER

ONE MAN THAWER

IMPERIAL PORTABLE COMPRESSOR

For the service of contractors, street railways and public service companies that have available electric current, the Ingersoll-Rand Company offers a new electric motor-driven Imperial air compressor of 118 cubic feet capacity that weighs about 4,450 pounds. It is made entirely of steel, mounted on a steel truck and enclosed in steel housing with easily removable doors. It is operated by either direct or alternating current motor with standard control and is equipped with a suitable incased intake unloader providing efficient regulation. Additional equipment includes air receiver, safety valve, drain valves, pressure gage service valves and hose lines.



MOTOR DRIVEN COMPRESSOR OF 118 FEET CAPACITY

The Yonkers Electric Light & Power Co., 9 Manor House square, Yonkers, N. Y., has completed plans for $75,000 electric power station.

MEAD-MORRISON TRUCK WINCHES

Truck winches manufactured by Mead-Morrison have been developed by specialists to secure the best results in quality, compactness, strength, durability and simplicity of operation especially intended to decrease idle time in loading and unloading trucks, thus making the operation of the latter more profitable.

For ordinary contract work the vertical capstan winch is preferable, and is particularly suited to pulling heavy material on and off the platform body. This winch is made in two sizes weighing 100 pounds and 300 pounds, respectively, and having a single line pull of 2,000 or of 5,000 pounds at the rate of 50 to 60 feet per minute.

TRUCK WINCH

On dump body trucks, the horizontal capstan winch is preferable when used only occasionally for pulling the trucks out of mud holes, but if it is used for pulling trailers and backfillers and to assist the truck in rough ground, the underslung drum is best because the rope is at all times coiled on the drum. The size of winch does not depend in any way on the size and model of the motor truck, but wholly upon the work to be done by the winch.

The light-duty horizontal winch, attachable to the side of the chassis, weighs 100 pounds and develops a 2,000-pound pull at a speed of 50 to 60 feet per minute.

Underslung drum winches weigh 550 pounds, have a maximum rope pull of 5,000 pounds, a drum capacity of 425 feet of 7-16-inch rope, and are mounted under the chassis where they occupy no space required for other purposes.

The manufacturers have also developed a sturdy, convenient and efficient truck crane of 1-ton capacity that can easily be installed on a motor truck, just behind the driver's seat, where it is operated with power from the motor. It has a hoist of about 10 feet with a working radius of 5½ feet and can be almost instantly installed and removed.

SOLVAY PAINTS

The Solvay Process Company offers a number of special brands of paint for specific purposes. Solvay stack paint, black, made from refined retort coke-oven pitch, will withstand great heat and is efficient up to 750 degrees Fahrenheit, beyond which temperature no paint can endure long. It is recommended for boiler stacks, draft flues, boiler fronts, steam pipes, etc.

Solvay graphite paint is a slow drying black paint for outside use, recommended for all kinds of structural steel. It has a covering capacity of 550 square feet per gallon, and dries in from 20 to 30 hours. It is made of graphite flakes cemented together with refined pitch. It is waterproof and unaffected by weather.

Solvay No. 10 Crysolite is also a black slow drying protective paint for structural steel work, for outside use only, and is stated to be in appearance and durability, the equal of the highest grades of graphite and linseed oil paint at about one-half the cost.

Solvay hydraulic paint is a heavy bodied black pitch paint with a covering capacity of 400 square feet per gallon (equal to 3 tons of architectural steel). Dries in from 12 to 16 hours, is uninjured by lime or alkali found in cement or mortar which may be placed against it, and is recommended for architectural steel and for all submerged steel work.

Solvay concrete coating is a black dense, insoluble pitch compound with a covering capacity of 80 to 100 square feet per gallon, which is recommended for waterproofing brick, stone and concrete walls and cement floors.

INDUSTRIAL NOTES

The Prospect Construction Co., Inc., has opened an office in Philadelphia, Pa., to engage in general contracting and engineering work.

The Concrete Engineering Co., Omaha National Bank building, Omaha, Neb., is now building new warehouse space at its Chicago and Omaha plants, and providing additional manufacturing facilities which will enable them to carry larger stocks of their Ceco fireproofing and reinforcing materials.

Charles T. Topping, formerly of the Charles T. Topping Machinery Co., Pittsburgh, has decided to re-engage in the construction machinery business for himself. He has established his organization in the House building, Pittsburgh, and will act as district sales representative for the Austin Machinery Corporation, of Chicago.

Messrs. George Oldham & Son Co., manufacturers of pneumatic tools and appliances, Baltimore, Md., have established a branch at 165 High street, Fort Hill square, Boston, Mass., under P. Woolfolk. This company also carries a supply of tools and parts in Montpelier, Vt., which are distributed by Daniel McGovern.

A modern plant costing about half a million dollars will be built on five acres of land on the corner of Hanson street and Coxwell avenue, Toronto. Three companies will begin operations in the plant when it is completed; these being Crouse-Hinds Co. of Canada, Harvey-Hubbell and the Hubbell-Mack Machine Screw Co.

The DuPont interest has taken over the mill on the River road at Buffalo that was started by the Philadelphia Rubber Co. and whose construction was stopped some time ago. After changing the plans somewhat, the DuPont Co. is to complete the mill and begin manufacturing fibre silk there.

LA FRANCE EQUIPMENT EXCEEDS TEST REQUIREMENTS

Waterloo fire department's two new La France combination truck and engines met every requirement at the official tests December 13 and the apparatus was formally accepted. Interest was especially keen in the performance of the big type 12 motor and engine pump, and the great stream of water hurled 200 feet at a rate of 1,036 gallons a minute.

Official markings on the tests of the pumping engine rated at 1,000 gallons per minute at 120 pounds pump pressure were as follows:

Capacity test: Three lines of hose, 300 feet, 200 feet and 100 feet long, combined into one deluge nozzle with 2-inch tip, developed pump pressure of 120 pounds; nozzle pressure, 76 pounds; vacuum, 20 inches, and discharged 1,036 gallons of water per minute.

Pressure tests, rated to deliver 500 gallons per minute; one line of hose 200 feet, with 1¼-inch nozzle tip, registered pumping pressure 205 pounds; nozzle pressure, 126 pounds; vacuum, 12 inches; water discharge, 520 gallons per minute.

Special capacity test: Three lines each 200 feet, with three streams, developed a pump pressure of 100 pounds; nozzle pressures, 79, 70 and 80 pounds; vacuum, 20 inches; water delivered from three 1⅛-inch nozzles, 961 gallons per minute.

Special capacity test: Four lines of hose each 200 feet, and four streams from 1-inch nozzles, developed pump pressure of 90 pounds; nozzle pressures, 80, 72, 70 and 70 pounds; vacuum, 20 inches; water delivered, 1,013 gallons per minute.

The junior pumping fire engine and truck, with a rated capacity of 300 gallons per minute, delivered 337 gallons per minute through 1-inch nozzle and 200 feet of hose.

Manufacturing operations will soon begin at the new plant of Machinery & Foundries, Ltd., on Pearl street, Brockville, Ontario, which is now rapidly nearing completion. The industry, which is a new one for the town, will comprise a general foundry and machine shop business, with special attention to pumps of all descriptions, both hand and power-operated.

The Chicago Bridge & Iron Works, 37 East Van Buren street, Chicago, Ill., announce the opening of a new sales office in the Forsythe building, Atlanta, Ga. This office will be in charge of Joseph L. Zeller, who will cover the states of Georgia, Alabama, Tennessee and Florida.